Vol. IV, No. 10 OCTOBER, 1949

AGRICULTURAL CHEMICALS

In This Issue:

Insecticide Residues on Foods • National Agricultural Chemicals Association Elects Ernest Hart • Chemical Control of Ribes Discussed • Soil Nutrients Removed by Harvesting Plants • Details of Food & Drug Tolerance Hearings in January • Fertilizer & Economic Poisons Divisions of ACS Meet • Nat'l. Shade Tree Conference Report • Four Important Meetings in Capital this Month

Assured Supply of Insecticide Materials

...with Price Protection to time of delivery

Are you wondering about your next season's supplies of insecticide materials?

Now is a good time to make arrangements for adequate supply next year.

We will earmark your next season's supply...assure you of delivery when you need it...**and at the same time guarantee that you need pay no more than current market prices at time of delivery.**

Let one of our representatives help you work out a plan for **assured supply with price protection.** Write today.

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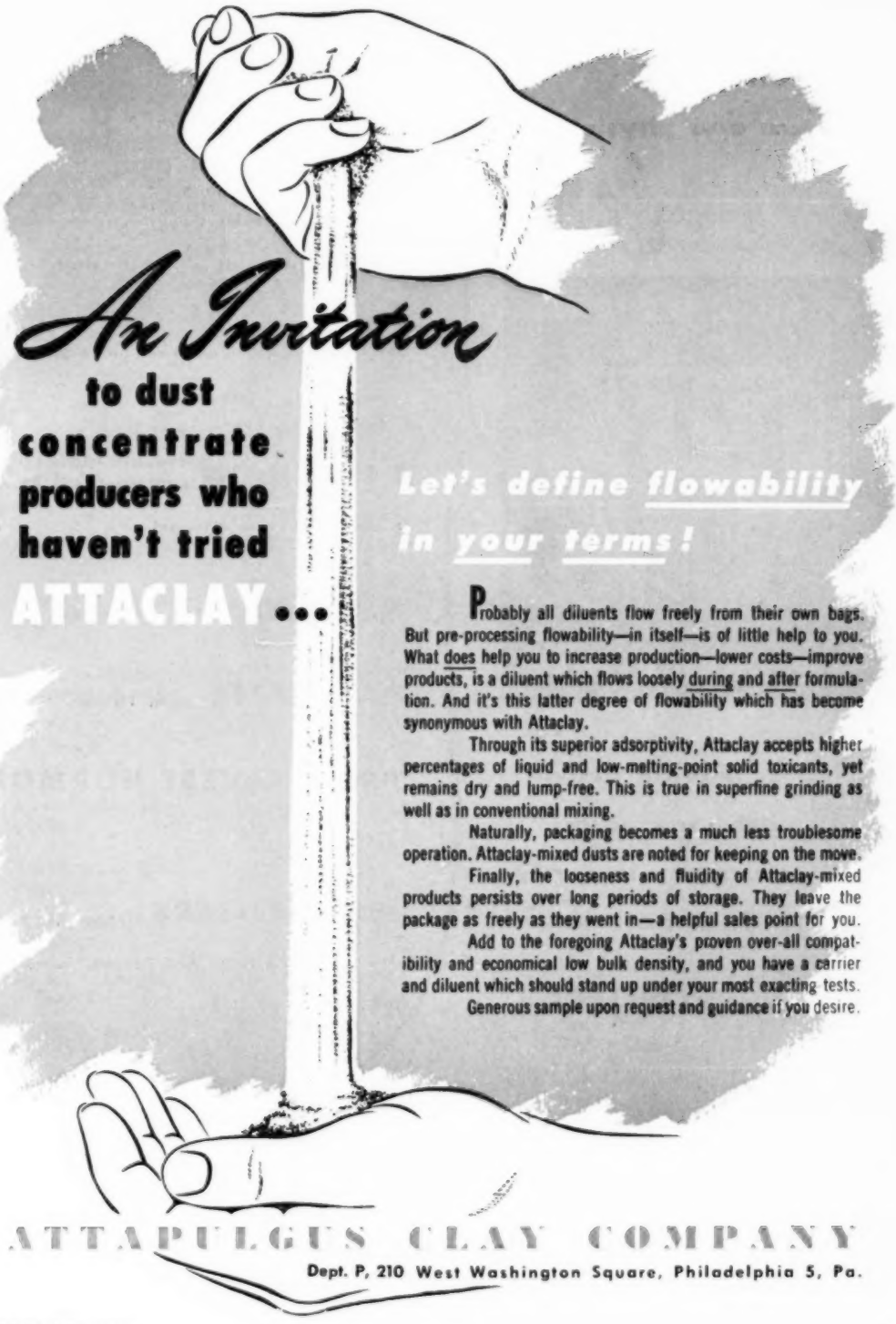

An Invitation

to dust concentrate producers who haven't tried ATTACLAY...

Let's define flowability in your terms!

Probably all diluents flow freely from their own bags. But pre-processing flowability—in itself—is of little help to you. What does help you to increase production—lower costs—improve products, is a diluent which flows loosely during and after formulation. And it's this latter degree of flowability which has become synonymous with Attaclay.

Through its superior adsorptivity, Attaclay accepts higher percentages of liquid and low-melting-point solid toxicants, yet remains dry and lump-free. This is true in superfine grinding as well as in conventional mixing.

Naturally, packaging becomes a much less troublesome operation. Attaclay-mixed dusts are noted for keeping on the move.

Finally, the looseness and fluidity of Attaclay-mixed products persists over long periods of storage. They leave the package as freely as they went in—a helpful sales point for you.

Add to the foregoing Attaclay's proven over-all compatibility and economical low bulk density, and you have a carrier and diluent which should stand up under your most exacting tests.

Generous sample upon request and guidance if you desire.

ATTAPULGUS CLAY COMPANY

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Consistently *High* chemical and physical qualities . . .

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FOR AGRICULTURE

to provide growers with maximum efficiency in spray & dust materials

DDT Technical (Ground and Flake), Dust Base, and Wettable Concentrates; Emulsifiable and Solvent Concentrates; Special Formulations.

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WEED-KILLERS Trichloroacetates (Pre-Dormant); 2,4-D Acid, Amine, Sodium Salt (Pre-Harvest).

For your requirements, write or phone:

Insecticide Department

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

Offices in Principal Agricultural Centers from Coast to Coast

AGRICULTURAL CHEMICALS

AGRICULTURAL CHEMICALS

THIS MONTH'S COVER

The result of good farming practices which include periodic spraying with an effective insecticide. This hardy, healthy bean patch on a Pennsylvania truck farm was dusted in order to protect the undersides of leaves where bean beetle colonies are hatched. (Photo courtesy U.S. Industrial Chemicals, Inc.)

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A Monthly Magazine For the Trade

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Among the important developments of Dow's continuing research in the agricultural chemical field is the effective new grass killer—Dow Sodium TCA 90%. Introduced during the last growing season, Dow Sodium TCA 90% has proved effective in spot-treating local infestations of certain noxious grasses in crop lands and pastures, as well as over-all treatment of grasses along roadsides, irrigation and drainage ditches, fence rows and right-of-ways.

Dow Sodium TCA 90% will control perennial grasses such as Johnson, quack, Bermuda and para. It can also be used at lower dosages to retard growth where the maintenance of a grass cover is desired. At the same lower dosages, Sodium TCA 90% will kill small annual grass seedlings of crabgrass, foxtail, chess and of perennial species.

Dow Sodium TCA 90% is compatible with Dow's 2,4-D and 2,4,5-T weed killers—also with general contact sprays prepared from Dow General or Dow Contact Weed Killers. Experiment stations recommend this new Dow grass killer for use on grass-infested crop lands in the fall after the crop is harvested. Used in this manner, the field will be relatively grass-free in the spring.

Your inquiries are invited. Write Dept. 350, The Dow Chemical Company, Midland, Michigan.

AVAILABLE IN THE FOLLOWING SIZES:

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for use with ANY power source

Recommend Oberdorfer Pumps with confidence for use with any power — direct drive from tractor P.T.O., pulley drive from tractor P.T.O., auxiliary gas engine, or electric motor. They are efficient and practical for any of these installations, recognized as the North American standard pump for spraying use.

We have prepared a new folder showing these different applications, and including performance tables for different sized pumps at various R. P. M.'s. This folder will help you sell more Oberdorfer Pumps. It is available in quantities to Oberdorfer dealers for distribution to your customers, if you wish. Write for a copy today — ask for Bulletin A-2.

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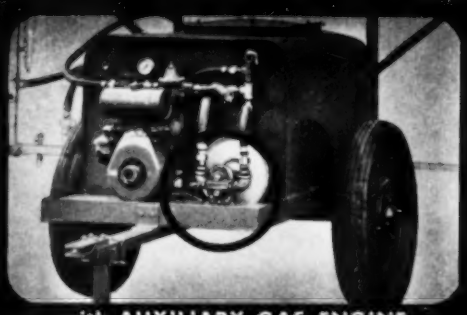
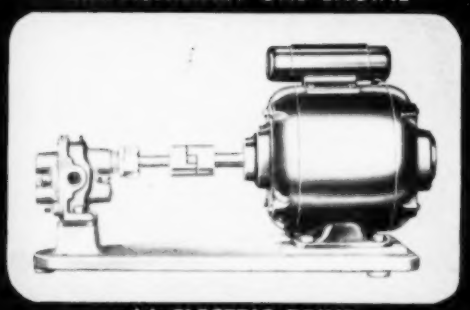
Oberdorfer Foundries, Inc., Syracuse, N.Y.

DIRECT POWER TAKE-OFF



with AUXILIARY GAS ENGINE

with PULLEY DRIVE



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FIRST AGAIN in pest control!

ORTHO
SCIENTIFIC PEST CONTROL
REG. U.S. PAT. OFF.

...the first name in Scientific Pest Control

Here is the year's BIGGEST news in FLY CONTROL...

LINDANE JUST APPROVED BY FEDERAL AUTHORITIES.

...and ISOTOX Dairy Spray containing LINDANE is available right now!

Here are the facts on ISOTOX Dairy Spray containing APPROVED LINDANE, the potent new insecticide with a 3-way residual killing power!

ISOTOX DAIRY SPRAY KILLS FLIES. New ISOTOX Dairy Spray, containing approved lindane, is the fastest fly control. It kills flies resistant to DDT and Methoxychlor. It kills flies immediately—they don't spin around half dead for hours. It kills flies by direct contact and by residual action for about 4 weeks, depending on the weather.

ACTUAL USAGE SUCCESSFUL. Dairymen for the past year—and experiment stations in New York, New Jersey, Texas, California, in addition to other areas—have been using ISOTOX. They report outstanding success in killing flies. Dairy pest control operator A. S. Lasley, Bellflower, Calif., says:

ISOTOX Dairy Spray will clean up a dairy quicker than anything I've ever used. DDT at its best used to take 6 to 12 hours to kill a fly. ISOTOX Dairy Spray drops them right on the floor! And I have found that a regular program of spraying with ISOTOX Dairy Spray will put the dairyman money ahead, because he gets a good cleanup of flies.

ISOTOX DAIRY SPRAY containing lindane is a wettable powder. It is used at the rate of 10 pounds to 100 gallons of water. It is packed conveniently in 1 pound and 4 pound cans and 25 pound pails.

OTHER USAGES. ISOTOX Dairy Spray, containing lindane, is an excellent residual spray in buildings where dairy products are handled. Also ISOTOX Dairy Spray not only controls flies on and around dairy barns, farm buildings, manure piles and other fly breeding places, but it may be used to control certain pests on livestock, such as ticks and lice on beef cattle, sheep ticks on sheep, lice on beef cattle and lice on beef cattle, sheep, scab or sarcoptic mange on dairy cattle, beef cattle, sheep and hogs. It also controls roaches, ants, mosquitoes and certain other insects.

ISOTOX Dairy Spray mixes readily with water for spraying. It can also be used as a paint around windows, doors, walls and ceiling beams—wherever flies gather. Directions for uses are printed on the label.

Phone your dealer or contact our offices listed below for immediate shipment. ISOTOX Dairy Spray will save you money through better pest control resulting in higher milk production.

CALIFORNIA SPRAY-CHEMICAL CORP.

Head Office: Richmond, California

Pacific Northwest	81 S. E. Yamhill St., Portland, Oregon
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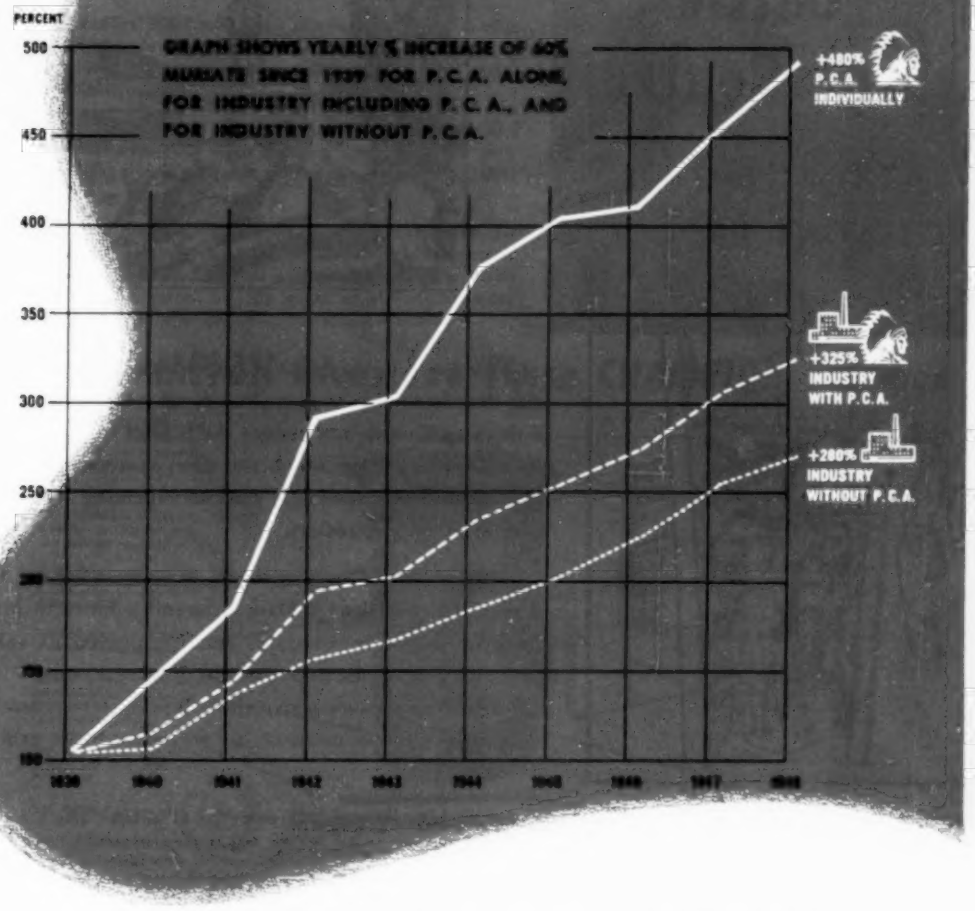
We've been doing some figuring...



1948 was a record year for domestic Potash. Using '39 as a base, the industry—not including P.C.A.—showed an increase of 280% in 60% Muriate. P.C.A. production lifts the industry increase to 325%. ***P.C.A. alone shows a High Grade Muriate increase for the same period of 480%.***

95% of all P.C.A.'s '48 deliveries were in the form of 60% Muriate. Our new $4,000,000 production and refining facilities now are operating. Our deliveries for '49-'50 will break all previous records. In fact, P.C.A.'s production capacity for 60% Muriate this year will exceed by some 150,000 tons the entire potash consumption — all grades — of the nation ten years ago.

These figures are graphic evidence of the leadership P.C.A. has won . . . leadership in volume, in economy to you and to agriculture.

P.C.A.
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RED MURIATE

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Carlsbad, New Mexico

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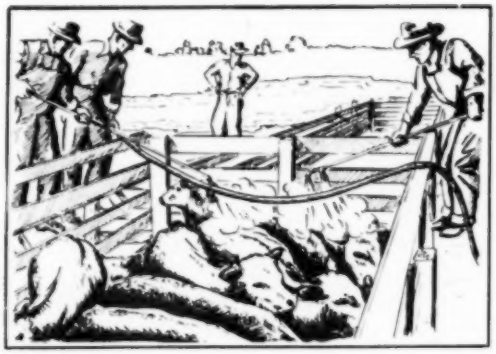
FOR EASY, EFFECTIVE, ECONOMICAL

Cattle Grub Control

TRY ORBISCIDE ROTENONE PRODUCTS!



Cattle grubs in the backs of beef animals may interfere with their normal fattening. Numerous grubs in the backs of dairy cattle also may reduce the flow of milk. Now is the time to urge your ranch and dairy customers to treat their animals promptly and plan on repeating the treatment as often as necessary.

Rotenone is the only material recommended by the Bureau of Entomology & Plant Quarantine for cattle grub control. It is safe, effective, and has proved its value through extensive use over a period of several years.

Bureau entomologists give the following recommendations for the use of rotenone in controlling cattle grubs:

SPRAY—Use 7½ lbs. of 5% rotenone bearing derris or cubé powder to 100 gals. of water. Apply with power sprayer at 400 lbs. pressure. Use 1 gal. of spray per animal, holding the spray nozzle 12 to 16 inches from the backs of the animals. This is the treatment most commonly used.

WASH—Use 12 ozs. of 5% rotenone powder and 4 ozs. of granular laundry soap to 1 gal. of water. Apply about 1 pint per animal, rubbing it into the back thoroughly.

DUST—Mix thoroughly 1 part of 5% rotenone powder with 2 parts of pyrophyllite or Tripoli earth. Use about 3½ ozs. of dust per animal, rubbing it into the hair and grub openings with a stiff brush.

DIP—Use 10 lbs. of 5% derris powder and 2 ozs. of sodium lauryl sulfate to 100 gals. of water. Hold the animals in the dipping vat for two minutes.

Orbis can supply you with the right rotenone product for the job in your particular locality. Write, wire or phone today for complete information. Our technical staff is ready to help you with your insecticide problems.

CATTLEMEN—Specify Orbiside Insecticide Concentrates when ordering from your local dealer.

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FACTORY AND LABORATORY: NEWARK, N. J.

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DERRIS POWDER

CUBÉ RESIN
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CHAMPION *Double-Action means* FASTER DUSTING

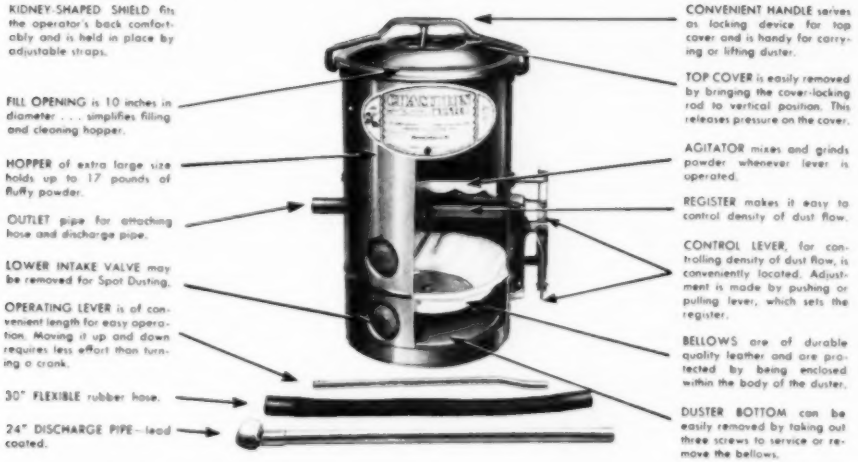
Saves Time • Labor • Powder

NOW you can get *more* and *better* dusting done in less time with the Champion Double-Action Duster. Its modern, advanced design means a *continuous* flow of powder whenever the lever is operated.

You dust, grind and mix powder with each up-stroke and with each down-stroke. With no interruption in the flow of powder, Champion's double action saves you time, labor and powder.

The Champion fits comfortably on the operator's back. Its easily operated bellows can throw a screen of dust exactly where wanted within a range of 30 feet. No heavy or bulky mechanisms are involved . . . no gears to get out of order and become hard to operate. Note the many features.

Only CHAMPION *Gives You These* CHAMPION *Features*


KIDNEY-SHAPED SHIELD fits the operator's back comfortably and is held in place by adjustable straps.
FILL OPENING is 10 inches in diameter . . . simplifies filling and cleaning hopper.
HOPPER of extra large size holds up to 17 pounds of fluffy powder.
OUTLET pipe for attaching hose and discharge pipe.
LOWER INTAKE VALVE may be removed for Spot Dusting.
OPERATING LEVER is of convenient length for easy operation. Moving it up and down requires less effort than turning a crank.
30" FLEXIBLE rubber hose.
24" DISCHARGE PIPE—lead coated.
CONVENIENT HANDLE serves as locking device for top cover and is handy for carrying or lifting duster.
TOP COVER is easily removed by bringing the cover-locking rod to vertical position. This releases pressure on the cover.
AGITATOR mixes and grinds powder whenever lever is operated.
REGISTER makes it easy to control density of dust flow.
CONTROL LEVER, for controlling density of dust flow, is conveniently located. Adjustment is made by pushing or pulling lever, which sets the register.
BELLOWS are of durable quality leather and are protected by being enclosed within the body of the duster.
DUSTER BOTTOM can be easily removed by taking out three screws to service or remove the bellows.

EASY to FILL • EASY to CLEAN

Big, 10-inch hopper cover makes the new Champion easy to fill and clean. Duster weighs 14 lbs. empty; holds up to 17 lbs. of fluffy powder.

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no more efficient solubilizer for 2,4-D

DIMETHYLAMINE

amine	pounds of 2,4-D acid neutralized by one pound of amine	molecular weight
DIMETHYLAMINE	4.9	45
Diethylamine	3.0	73
Triethylamine	2.2	101
Diethanolamine	2.1	105
Diisopropanolamine	1.7	133
Triethanolamine	1.5	149
Triisopropanolamine	1.2	191

Compare it with the other amines. Pound for pound, dimethylamine goes further than any of the others listed. Its efficiency as a solubilizer for making 2,4-D salt concentrates is from 1-3/5 to 4 times greater. Dimethylamine's excellent solubilizing characteristics, low molecular weight, and high efficiency make it an outstanding amine for the manufacture of 2,4-D concentrates. Pound for pound, there's no better buy! It will pay you to investigate dimethylamine further. Write, wire, or phone Commercial Solvents today!

PROPERTIES

At ordinary temperatures and pressures Dimethylamine is a gas possessing a strong ammoniacal odor. It is sold as an aqueous solution.

Boiling Point: 6.88°C at 760 mm of mercury
Solubility: Soluble in water, alcohol, ether, and many organic liquids
Flash Point, TCC (38% solution): 21°F
Weight per U. S. Gallon (25% solution): Approximately 7.8 pounds at 68°F

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Also Used in the Manufacture of:
Disinfectants and Germicides
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CSC DIMETHYLAMINE IS AVAILABLE FOR PROMPT SHIPMENT

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2 SHUR-CLOSE Bags reduce sifting when packed

Fertilizer, chemical, food product and flour plants all over the country are reducing dusting and sifting with the brand new SHUR–CLOSE Valve Bag.

Unlike ordinary valve bags, the SHUR–CLOSE overlapping valve action gives a quick, positive seal immediately after bags are filled. There's less dusting when packing and an absolute minimum of sifting when bags are packed.

Consumers are requesting shipments in SHUR–CLOSE valve bags because they prevent waste; while operating men in packing rooms claim SHUR–CLOSE bags eliminate objectionable dust in the packing operation.

If you pack fertilizer or chemicals, you should arrange immediately to have an A&S Packaging Sales Technician demonstrate SHUR–CLOSE Valve Bags in *your* plant using *your* filling machines.

A&S SINCE 1859

ARKELL and SMITHS

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2,000 Pound Lots	80c lb.
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Less Than 400 Pound Lots	84c lb.

Packed in 400 lb. lined open head drums or 65 lb. lined pails as desired.

INQUIRE FOR PRICES ON LARGER QUANTITIES

TOXICHLOR OS-20

An oil soluble concentrate containing 20% technical chlordane. Suitable for dilution for use as a residual spray, fogging spray, or as an adjuvant for pyrethrum or thiocyanate space sprays.

5 Gal. Lined Cans	$ 2.15 Gal.
30 Gal. Lined Drums	2.05 Gal.
53 Gal. Lined Drums	2.00 Gal.

100 Gal. Lots	Less 10c Gal.
250 Gal. Lots	Less 20c Gal.
500 Gal. Lots	Less 30c Gal.

(Basis One Shipment)

All Prices F. O. B. Delivered

High Strength, Water Emulsifiable Chlordane Concentrates and Wettable Powder also available at low prices. Inquire for latest quotations.

TERMS: Net 10 days to firms with satisfactory credit ratings; others cash with order.

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KANSAS CITY, MISSOURI

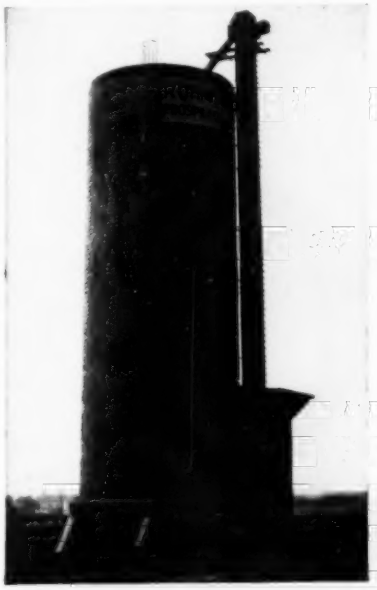
BAUGHMAN *Customized

FERTILIZER HANDLING EQUIPMENT

DESIGNED TO INCREASE YOUR EFFICIENCY. Store in bulk . . . deliver in bulk—eliminate bagging. The bulk storage plant cuts handling costs . . . makes you more money. The Baughman Belt and Bucket Elevator is the mark of an efficient bulk plant.

MASS-PRODUCED TO SAVE YOU MONEY. Easily assembled from standard 10' sections economically produced by assembly line methods. No costly custom-built installation required. Ruggedly built of high tensile alloy steel.

*CUSTOMIZED—designed for the job. These Baughman products are specially built for commercial fertilizer operations.



SPREADER FOR COMMERCIAL OPERATORS

This Baughman Self-Unloading Body is a money maker! Phosphate Spreader attachment spreads 16½' widths . . . covers 2 acres per mile at 15 mph. Easily detached, permitting use of body for spreading lime, unloading and spreading road rock, delivering coal and grain—all kinds of specialized profitable jobs.

BAUGHMAN SCREW CONVEYORS

Load and unload cars and trucks quickly and efficiently. Large capacity 9" conveyor screw easily handles dry powdered lime, phosphate, commercial fertilizers—up to 40 bushels per minute. Top performance from the horizontal to 50°. Available with or without wheels. Ruggedly built of high tensile alloy steel. Direct line shaft drive. Gasoline or electric power.

We invite your inquiries also on our special built-to-order materials handling equipment. WRITE FOR FULL DETAILS.

BAUGHMAN

BAUGHMAN MANUFACTURING CO., Inc.
910 Shipman Rd., Jerseyville, Ill.
"There is a Baughman Distributor Near You"

BEMIS paper bags for chemicals

As one of America's largest producers of multiwalls and other paper bags, Bemis naturally makes many types to serve varied packaging requirements.

For the chemical industry, several types of construction are produced. The paper bags most generally used are shown here.

Note the variety of the Bemis line when you are buying paper bags for chemicals. It gives you wider choice in quality bags from a single source.

Bemis

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San Francisco, Calif. • Vancouver, Wash. • Wilmington, Calif.

Baltimore • Boise • Boston • Brooklyn • Buffalo • Charlotte • Chicago • Cleveland • Denver
Detroit • Indianapolis • Jacksonville, Fla. • Kansas City • Los Angeles • Louisville • Memphis
Minneapolis • New Orleans • New York City • Norfolk • Oklahoma City • Omaha • Phoenix
Pittsburgh • St. Louis • Salina • Salt Lake City • Seattle • Wichita

Most formulators of insecticides see a lot of lost sales when they look backward on the past season . . . sales that were lost because they had no merchandise to sell. And those lost sales also mean lost bushels of fruits and grains because of weed and insect damage.

Now, look forward into next summer and get set to meet the demand of agriculture for insecticides and herbicides. The farmer demands delivery the day he realizes his need. Adequate stocks on *hand at the right points* is the way to avoid lost sales . . . to make extra profit . . . to help save the crops of orchards and fields.

Place your order for insecticidal chemicals and herbicidal chemicals . . . now.

Information and quotations on Monsanto's insecticidal and herbicidal chemicals will be sent to formulators upon request. Mail the coupon, contact the nearest Monsanto Sales Office or write: MONSANTO CHEMICAL COMPANY, Desk K, Organic Chemicals Division, 1766 South Second Street, St. Louis 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

MONSANTO INSECTICIDAL CHEMICALS

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(Commercial Grade)
SANTOBANE® (DDT)
SANTOCHLOR®
(para-Dichlorobenzene)
TRICHLOROBENZENE, Technical
NIFOS®-T
(Tetraethyl Pyrophosphate, Tech. For agricultural use only)
NIRAN®
(Parathion. For agricultural use only)

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Antarox A-201	Poly-Glycol Ether	Liquid	Stable in: acids, alkalis, hard water, metal ions, boiling water, on storage	Soluble in: water, hard water, carbon tetrachloride, ethanol, vegetable oil, acetone, ethylene glycol, mineral spirits, toluene	Emulsifier for oils, waxes, aromatic solvents, insecticides, metal cleaning compounds. Excellent detergent
Antarox A-400	Poly-Glycol Ether	Liquid (Essentially odorless)	Acids, alkalis, hard water, boiling water, on storage	Soluble in: water, hard water, carbon tetrachloride, ethanol, vegetable oil, acetone, ethylene glycol, mineral spirits, toluene	Emulsifying, spreading, cleaning agent. In metal cleaning, polishing compounds, emulsifiable insect sprays. Solubilizer for perfumes
Antarox A-480	Poly-Glycol Ether	Liquid (Essentially odorless)	Stable in: acids, alkalis, hard water, metal ions, boiling water, on storage	Soluble in: water, hard water, ethanol, acetone, ethylene glycol. Moderately soluble in: carbon tetrachloride, vegetable oil, mineral spirits, toluene. Insoluble in: mineral oil	Many applications. Excellent wetting and detergent properties. Used as alkaline degreaser or as assistant in alkaline metal cleaners. Emulsifier for creams
Antarox B-100	Poly-Glycol Ester	Liquid	Stable to: hard water, metal ions, on storage, mild alkaline solutions, mild acids	Soluble in: carbon tetrachloride, ethanol, vegetable oil, mineral oil, ether, acetone, mineral spirits, kerosene, gasoline, benzene, toluene, chlorinated hydrocarbons. Insoluble in: water, hard water, electrolyte solutions but disperses in aqueous solutions	Emulsifier for cosmetic creams, assistant in kerosene cleaning of motors, cutting oil emulsifier, and in emulsion degreasing. Dry cleaning solvent, compounding, spotting compounds
Antarox B-290	Poly-Glycol Ester-Ether	Liquid	Stable in: mild acid or alkaline solutions, to hard water, metal ions, on storage	Soluble in: water, hard water, carbon tetrachloride, ethanol, vegetable oil, ether, acetone. Insoluble in mineral oil	Emulsifier for vegetable and animal oils, fatty acids, waxes, and a wide range of organic substances. In hair groom oils, herbicide emulsifiable concentrates, waxes and polishes, cosmetic creams, emulsion type paints
Antarox D-100	Poly-Glycol Ether	White, waxy paste	Stable to: acids, alkali, hard water, metal ions, boiling water, on storage	Soluble in: water, hard water, carbon tetrachloride, ethanol, vegetable oil, acetone, benzene, toluene, chlorinated hydrocarbons. Insoluble in: mineral oil, mineral spirits, kerosene, gasoline	Emulsifier for animal and vegetable oils, fatty acids and waxes. In waxes and polishes, cosmetic creams and lotions. Assistant in alkaline metal cleaning, emulsion type paints

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THE EDITOR COMMENTS

INDUSTRY representatives will play an important part in the Food and Drug Administration hearings to determine the amounts of pesticide residues which will be tolerated on fresh fruits and vegetables. These sessions, slated to begin on January 17, will take up three phases of the problem: 1) a study of deleterious effects resulting from the use of pesticides in producing fresh fruits and vegetables, 2) the formulation of regulations to limit the amount of these chemicals, including the establishment of safe residue tolerances for fresh fruits & vegetables, if the evidence shows effects harmful to the public health, and 3) to repeal or amend the 1944 regulation limiting the amount of fluorine residues on apples and pears.

Thomas B. Bellis, of FDA, has given some good pointers to those who wish to submit data at the hearings. The proposal has been made broad enough to include evidence on all the poisonous or deleterious substances which are likely to be required for the production of fresh fruits and vegetables, not merely apples and pears. Entomologists and the industry can be "very helpful", he says, in furnishing facts about which fruits and vegetables require the application of pesticides for production and what are the specific pests to be controlled. Also needed is information on what materials are essential in such control procedures. Producers of processed foods, likewise, should gather data on the extent to which the residues from pesticides may be avoided by washing, brushing, or other means of removal, it is suggested.

Witnesses at the hearings are subject to cross-examination, and will testify under oath. Companies which wish to submit evidence should not delay in getting briefs together. Some witnesses may find it convenient to write out what they have to say, while others may enter their evidence by answering questions asked by their attorneys. Five copies of each exhibit should be furnished by the witness, and it is suggested further that additional copies be made available to attendants at the hearing in order to avoid misunderstanding.

The industry is certainly not being caught flat-footed as the hearing date approaches. We hope that there will be ample preparation so that the sessions may terminate speedily with the long-sought tolerance figures at last available. This done, the confusion which has characterized many aspects of the insecticide trade may be reduced greatly in the future.

ADVICE that an improved supply picture should make fertilizers more plentiful next season, has apparently caused many purchasers to postpone their buying even though this is the time when such purchases are normally made. It is typical of farmers, as every supplier knows, that if a good supply looms for next year, they tend to wait until later to lay in their needs.

The fertilizer industry has a growing fear that if this should happen, there will be a last-minute avalanche of orders for fertilizers which may be difficult to meet. Obviously, the industry cannot manufacture and ship the larger portion of a year's tonnage within a period of a few months. But an orderly movement of fertilizers now will enable the industry's expanded facilities to be used to advantage, so that the normal U.S. requirements may be met without panic.

Farm papers, county agents and the Extension Services are urging farmers to buy now, but whether or not such advice will be taken is a matter of conjecture. Rural people frequently balk at such suggestions, taking such talk as sales promotion. During the war years, they could see the sense of anticipating their fertilizer requirements in advance and ordering early when a shortage existed, and made looking ahead a "must". But now . . .

Storage facilities simply do not exist for any large portion of the nearly 20,000,000 tons of fertilizer expected to be sold in 1950. Storage facilities by manufacturers, that is. If the manufacturer could keep the material moving now, he could easily supply next spring's demand. Otherwise, a bottleneck of production and distribution is inevitable, and frantic voices will again be heard shouting for government to step in and supply what private industry can't. If those same voices were used just now to order next year's supply, it might save a lot of breath later!

How Pest Control Programs Affect

Residues in Foods

THE role of the entomologist and the importance of insecticides in agriculture and public health were regarded with considerable indifference by most of the public for many years, up through the 1930's. So far as insecticidal materials were concerned, the arsenicals, lime-sulfur and spray oil held the field, and there was very little excitement on the part of the public concerning the effect of these materials on human beings. About the only ripple on the otherwise calm scene was a campaign on the part of the U. S. Food and Drug Administration to reduce the amount of arsenic on fruits at harvest time.

However, the public interest in such matters was awakened dramatically by the introduction of DDT during the war years. For the first time in history, it became possible to control insect pests in the tropics, and the incidence of malaria was reduced rapidly even in areas where American armed forces were operating in all types of vermin and disease-ridden environments. Recognition that the use of a certain insecticide could bring about such important results was surprising to the world at large, and entomologists began to receive the attention of many who had previously regarded them as a group of scientific individuals whose activities had little or no effect on the lives of ordinary citizens.

Thus, when peace returned, the entomologist, in his new status of recognized worth, began to explore the usefulness of DDT and other new insecticides in connection with the traditional problems of pests on crops and animals. Spectacular results were forthcoming, and the entomologist rose even higher in the public esteem. The new insecticides, particularly DDT, were considered as the finest fruits of modern chemistry and worthy of ranking in importance with the newer medical discoveries.

But just as every action creates a reaction, an increasing suspicion of the new insecticides has been growing in the public mind. Such an attitude has been generated by the "lunatic fringe" which has claimed that the public is being poisoned on a nation-wide scale through use of insecticides. Numbers of alarming articles have been given wide circulation in the more irresponsible press. This agitation developed to the extent that the U. S. Department of Agriculture recently felt it necessary to issue a statement that the milk supply of the country is not dangerous because of contamination from DDT. It is quite possible that law-making and regulatory organizations, with the best of intentions, may embark on a program of restriction which will do great harm to everyone. Such excesses could ultimately bring into disfavor even legitimate regulation of the insecticide industry.

Fortunately, this whole matter is subject to testing and can be settled on the basis of facts, once these have been ascertained and, accordingly, it differs sharply from questions of politics or economics which all too often are considered on the basis of rumor, half truth, prejudice or hysteria. Among many ways in which the matter of insecticidal residues may be examined, perhaps four questions will cover the essentials:

1) *Are poisonous chemicals necessary in the rearing of plants and animals?*
2) *Are those now in use the least harmful that will be effective?*
3) *What amounts are dangerous?*
4) *Are these amounts exceeded in current practice?*

Answers to these questions must be given from the viewpoint of large scale production. It is easily possible to protect a few vines from a pest, e. g., diabrotica beetles, by crushing them individually and this same general method is still widely practiced in regions of the world where family holdings are limited to a few acres and, incidentally, where starvation is always just around the corner. The practice of growing the same crop in large acreages has intensified the insect problem. Nature has blessed insects with many progeny to ensure that some of them will find suitable hosts and if these are present on every hand the resulting population of pests soon reaches fantastic numbers. Also in America, above all other parts of the earth, rapid transportation in automobiles ensures that pests will become scattered much more rap-

[*] From an address given in Symposium on Chemical Treatment of Raw Materials, Annual Convention, Institute of Food Technologists, San Francisco, July 10, 1949.

by

W. M. Hoskins

University of California

idly and universally than if left to their own resources.

No Control - Heavy Loss

THE first question on the necessity for using insecticides may be answered by examining available data on losses when control is attempted and when it is not. Losses of agricultural products due to insects have been estimated at about ten percent for many years (Parker, 1942), though many authorities have considered this estimate too low. While figures such as an annual loss of 300,000,000 bushels of stored grains or 1,500,000 bales of cotton are impressive, they are harder to visualize than the benefits with individual crops when control measures are used. These ordinarily are expressed in terms of yield of saleable product, percentage of sound fruit, net profit per acre, or in some other quantitative measurement which may be compared with the same criterion for each treated plot. Field men in the University of California Division of Entomology and Parasitology have accumulated an immense total of such data and from these a few figures for important California crops may be cited (cf. Table I).

The various chemicals named in the Table were used in accordance with accepted practice. The details of dosages, etc., are complicated and are not particularly important for the present purpose. It is completely obvious, however, that losses are enormous when no chemical control measure is used. Also in most cases the new insecticides are notably superior to the older ones, *e.g.*, apples, apricots, pears. Numerous reports from other parts of the country lead to the same conclusions.

That the natural balance between harmful insects and their predators and parasites may be tipped sufficiently to give practical control of the pests has long been a cherished hope among entomologists. The various states and especially the Federal government allocated large funds over many years to the search for beneficial insects and to their artificial propagation prior to liberation in large numbers. Although some outstanding successes have resulted, when measured against the total number of serious pests it is quickly obvious that progress has been made at a snail's pace. It is likely that this research will be extended and given more generous support, but the time is not ripe to consider it as a general substitute for chemical control.

Similar considerations apply to

TABLE I

Effect of Insecticides upon Yield of Various Crops.

Crop	*Chemicals*	*Effect*	*Pest*
Alfalfa seed	DDT	32 to 136% increase	Lygus bugs
Apples	None	40 to 70% wormy	Codling moth
	Lead arsenate (6 sprays)	5 to 20% "	
	DDT (3 sprays)	less than 1% wormy	
Apricots	None	34% wormy	Codling moth
	Basic lead arsenate	8% "	
	Parathion	4% "	
	DDT	2.7% "	
	DDD	2% "	
Carrots	D–D	350 to 600% increase	Nematodes
Corn	None	40.1% infested	Corn earworm
	10% DDT	18.6% "	
	10% DDD	18.1% "	
Cotton	None	326 lbs/acre	Nematodes
	100 lbs. D–D	567 "	
	200 lbs. D–D	971 "	
Cotton seed	DDT	11.6 to 17.1% increase	Lygus bugs
Lima beans	None	1533 lbs/acre	Wireworms
	BHC	2270 "	
	D–D	2376 "	
	Ethylene dibromide	2256 "	
	Chlordane	2241 "	
	Toxaphene	1871 "	
Pears	None	40 to 60% wormy	Codling moth
	Lead arsenate	6% "	
	DDT	0.1% "	
Sugar beets	None	3564 lbs sucrose/acre	Wireworms and
	BHC	5738 " " "	Nematodes
	DDT	5462 " " "	
	D–D	5384 " " "	
	Ethylene dibromide	6496 " " "	
	Chlordane	5953 " " "	
Tomatoes	None	23% of plants injured	Hornworms
	Calcium arsenate	0.9% " " "	
	Toxaphene	2.6% " " "	
	DDT	1.9% " " "	
	DDD	0.5% " " "	
Walnuts	None	6.77% nuts infested	Codling moth
	Basic lead arsenate	2.16% " "	
	Standard lead arsenate	0.96% " "	
	DDT	0.13% " "	

Data taken from progress reports and personal communications from members of the staff in Entomology and Parasitology, University of California.

other auxiliary measures such as the development of resistant plant varieties. Much is being done with cultural practices. Reduction in size of contiguous plantings, rotation of short-lived crops and seeding at such time that the resulting plants will be out of season with their pests, all serve to interrupt the cycle of population increase. But, again, these efforts do not measure up to the problem.

In the light of these considerations it appears that the only possible answer to the first question is an unqualified agreement that insecticides are a necessity.

Is Lower Toxicity Possible?

THE second question, "Are the materials now in use the least harmful among those that are effective?," can be answered only for compounds so far known to be insecticidal. Doubtless many of considerable value remain to be discovered. The chief factors that determine whether a compound will find practical use as a pesticide are: 1) does it control one or more important pests when used in amounts that are reasonably cheap and that do not injure the treated plants or animals; and 2) is the final residue small enough to meet with approval of the Food and Drug Administration and various other public health authorities?

These requirements are obviously stringent and together they prevent many a possible pesticide from ever coming to widescale trial. The period from the first laboratory tests to commercial use usually covers several years during which the manufacturer has heavy expense and no income from the product. He must of course ever keep in mind that safety to the user and the general public is of extreme importance, not only from a humanitarian standpoint. Only a very foolish businessman would proceed to manufacture a material which when finally ready for sale could be turned into a gigantic white elephant through disapproval of the FDA. The farmer feels the same way, for he can hardly forget the painful experience of having nearly a whole crop condemned for excessive residue, or perhaps washed until it soon rotted. This happened to the apple industry during the early 30's when extremely low arsenic and lead tolerances were enforced by the FDA. Although these were later modified, the important point is that neither the makers of insecticides, the entomolgist who advises on their use, nor the farmers who apply them ever forget that it is good to keep the public welfare clearly in mind. Returning to the second question, it may be answered that considering the many factors that bear on choice of insecticides, those in use are the least harmful that are available and effective.

What Amounts to Use?

NOW comes the third question: "What amounts of these materials are a hazard in food?" This subject comes within the province of nutritionists and pharmacologists and can be answered only from the results of feeding tests conducted under proper conditions. There is general agreement that one is unlikely to encounter in foods enough toxic materials from either the old or new insecticides to cause ill effects upon ingestion once or even several times. Danger of acute toxicity appears to be slight, though a few cases are on record where digestive upsets have been caused from arsenicals on vegetables. Other more serious results come from a child spreading sweetened arsenical ant sirup on bread and eating it, but this is not a fair example of food contamination.

It is the possibility of chronic effects from long continued intake that has caused most of the difficulty. Two general methods are available for study of this matter. Animals may be fed the chemical in question through one or more generations, and the human population of a region where exposure is chronic may be examined. This latter method seldom is available, but it showed its value in the case of lead arsenate, for a study of persons who had lived all their lives in the northwest states and eaten contaminated fruit in immense quantities revealed no recognizable evidence of poisoning except for a half dozen individuals who handled lead arsenate the year around (Neal et al., 1941). It was after this study, made by the U. S. Public Health Service on direct order from Congress, that the FDA raised the tolerances on apples and pears. Again, during the 1930's when the use of selenium for control of fruit mites caused concern about its possible toxic effects, an extended medical examination of persons living in the Dakotas and neighboring states where the grain and many vegetables normally pick up several ppm selenium from the soil, did not reveal any trouble which could be traced to selenium.

Animal feeding, however, offers the greatest opportunity to determine the hazard from food contaminants. The levels at which chemicals are fed should have a close relation to the possible contamination. Thus much time has been consumed in the case of DDT because the first feeding experiments were done at the rate of several hundred parts per million. Consultation with the chemists who determined the residue from spraying would have made it clear to the pharmacologists that contamination never exceeded a very few parts per million. Thus, the long delay in securing pertinent data might have been shortened considerably.

A large variety of animals have been used in different experiments with insecticides administered in every imaginable manner. Since the hazard from residues in food always arises from the eating of this contaminated food, it is obvious that experimental tests should be made by adding the given chemical to the diet of a chosen animal species living under otherwise normal and favorable conditions. De-

spite the large number of tests, the only species for which fairly comparable data on old and new insecticides has been obtained is the white rat. Since in many biochemical behaviors this animal strongly resembles man, it is probable that ratings of comparative hazard will hold fairly well for humans. Table II shows data for several old and new insecticides. The shift to the newer compounds appears to be a long step in the right direction. A point of some interest is that rotenone and nicotine, two oldtimers to which there has been little if any objection, now appear to be more dangerous than most of the new insecticides.

The levels at which the FDA experimenters suggest the various materials might occur without any danger of harm resulting, are seen in a subsection of Table II. The most conspicuous point is the enormous ratio between the second and third columns. Engineers call this the "factor of safety" and consider that 10 is ample. We see that in the present instance the factor is several hundreds in most cases. Without arguing the validity of the suggested safe limits, the point of immediate interest is whether the residues resulting from actual insect control practices equal or exceed them. It may be kept in mind also that the "safe limits" are based on contamination of the whole diet, but in reality most of our food has no contact whatever with toxic residues (Robinson, 1949).

Table III presents a summary of the results of residue analyses made mostly in the entomology laboratory, University of California, but in a few cases taken from similar work in other western laboratories. The number of samples involved varies from many hundreds with the older materials to a few dozen or a few individuals but in all instances they have come from practical control programs and hence give a valid indication of what is to be expected from a given material on a given crop. Unless noted otherwise, these residues are on produce as harvested and may be reduced greatly by washing and other operations during processing.

Under DDT it may be noted that olives have the heaviest residue which is not removed well by processing. In view of this situation, its use on olives has been abandoned. Grapes, broccoli and spinach also show considerable amounts. The large tonnage crops, apples, cabbage, corn, pears, peas and tomatoes, appear to offer no special problem. Work now under way with apricots and peaches will determine how well the residue of DDT may be reduced during commercial processing. The necessary data regarding the relative effectiveness of DDT and DDD or methoxychlor are still incomplete, but it is clear that comparable amounts will be left. The suggested safe limits for these materials (5 ppm DDD, 10 ppm methoxychlor) would be easy to meet but the extra expense of heavier and probably more frequent applications is a serious objection.

The data in Table III are drawn chiefly from work in California but many reports from other states show residues of the same magnitude, though temperature, rainfall, air movement and possibly other environmental factors introduce minor variations. The main factors are the number of applications and the amounts needed to control the various pests in different regions. In general, the residues found in California are at least as high as in other states.

Exterior Contamination

IT should be noted that with most foods from plants, DDT contamination is entirely on the outside—the only exceptions being oily fruits such as olives and avocados. DDT is not taken in through the root system nor through the leaves and under normal use there is no translocation in living plants. Unfortunately, a similar situation does not hold for animals. Absorption occurs from the digestive tract, depending upon the diet, through the skin and through the lungs, and general circulation through the body gives opportunity for all organs to be affected. In the complicated balance between intake, breakdown to soluble forms which can be excreted, and accumulation in fatty tissues, the net result is a building up to several ppm in body fat and to a few ppm in the milk of lactating animals. This occurs when the latter are on a diet containing the DDT left from conservative use on alfalfa, peas or corn. The less stable methoxychlor accumulates much less, but its cost may reduce its use.

Benzene hexachloride has an uncertain future around foods or food crops. Its unusual insecticidal power, exceeding that of any known compound until the introduction of parathion, aroused much interest. Possible toxicity is of less concern than impairment of odor or flavor in food. Processors have been very zealous in preserving fresh and attractive flavors, so the mustiness of the first lots of BHC aroused instant apprehension. This fear was justified in the case of potatoes in New Jersey and tomatoes in California. To aid in this study, a delicate bioassay has been developed which gives a quantitative measure of contamination resulting from either direct application or soil treatment (Hoskins and Messenger, 1949). As a side result, the assay method concentrates the odor so that a few hundredths of a ppm in the original produce can be detected easily by the odor. An interesting application of BHC was on chickens which had been freed from lice by use of BHC on their roosts. Taste panels failed to detect anything unusual with the odor or flavor of the flesh, but the BHC could be detected readily by its toxicity to houseflies and by its odor in our so-called "sniff test."

The chief insecticidal ingredient in BHC is the gamma isomer and in the pure state this has very little odor. Manufacturers have perfected procedures to free material

from the odorous impurities. It is too soon to decide how successful this effort has been. Neither plants nor animals appear to act as concentrators of BHC but it is volatile enough to penetrate throughout exposed plants, animals and many stored products.

The latest chemical to receive widespread testing on plant crops is parathion, which the Germans introduced under the symbol "E-605" as a replacement for nicotine which was not obtainable during the war. It is an organic phosphate and thus represents a group not known previously to have insecticidal properties. The toxicity of this substance and of simpler relatives such as tetraethyl pyrophosphate (TEPP) is unquestioned since several unfortunate accidents have occurred during manufacture or during application. However, these materials are so unstable that a toxic residue scarcely can occur unless the application is made just before harvest. An example of the disappearance is given by the data for grapes in Table III. On larger sized objects the loss is much faster, *e.g.*, on apples it drops to a few tenths ppm within ten days. The suggested tolerance of 2 ppm will be no obstacle to its use, but the precautions to avoid injury to spraymen, airplane pilots and other workers are a nuisance and could become intolerable if health authorities should attempt to enforce some of the measures which have been suggested.

Lastly, Table III includes some interesting data on residues of nicotine on spinach and of arsenate on tomatoes. Since these materials are both highly poisonous, it is clear that the substitution of other materials has been a clear gain in safety. With few exceptions then it may be concluded that residues from the new materials do not exceed safe limits.

The relative safety of pest control materials in wide use at the present moment is a source of satisfaction and a strong indication that the method by which they have been developed is sound. Perhaps it will be helpful to consider for a moment how an agricultural chemical comes into use. The initial observation usually is made by a research worker in an agricultural experiment station, or more frequently of late by a worker in a chemical concern. In any event, development is possible only through the expenditure of much time and money, which is contributed almost always by the industry. Trials first on greenhouse scale, then in small plots in various parts of the country, then on semicommercial scale, if all favorable, lead up to cooperation with selected farmers who try the material in their regular production program. This is a critical test, for all that has gone before is meaningless if the material does not perform creditably in the hands of practical farmers.

Meanwhile such matters as method of manufacture, compounding for best use, methods for quantitative analysis, complaints from handlers in the factory, injury to all manner of plants and tests with several kinds of domestic animals have been going on. All these procedures usually consume several years. If everything is favorable, application will be made for license to sell. At this point a wide assortment of federal and state laws and agencies come into the picture. In particular for our present interest, departments of health and the FDA must be satisfied that the public welfare is not endangered.

As matters have gone in the past, provisional license has been given in most states and the FDA has withheld any statement until the time could be found for some feeding tests. As soon as some early results are available a tentative tolerance may be established, or if the results are not encouraging, threats of seizure may be made apparently with the hope of discouraging further development of

TABLE II

Some Comparative Toxicities for Chronic Exposure

Levels in whole diet for noticeable effect on growth of rats or degenerative changes in organs.

Chemical	*Concentration in diet*	*Suggested limit*	*Authority*
Arsenious oxide	0.001 to 0.01 ppm (slight effect) 0.03 to 0.1 ppm (marked effect)		Sollmann (1921)
Soluble lead salts	0.5		Calvery (1938)
Lead arsenate	12.3		Smyth & Smyth (1932)
Cryolite	260		Smyth & Smyth (1932)
	14 (effect on teeth)		Marcovich, Shuey and Stanley (1937)
Rotenone	31	5	Lehman (1948, 1949)
Pyrethrins		10	
Nicotine	60		
DDT	100	1 (in general) 3 (in apples & pears)	
DDD	2500	5	
Methoxychlor	< 5000	10	
γ BHC	400	3 to 5	
Chlordane	250	(same as for DDT)	
Parathion	25	2	
Toxaphene	1200	5 ?	

the material. Only after prolonged uncertainty is a definite ruling made and this may be changed later as in the lead arsenate and fluorine instances.

With the purpose of improving this rather cumbersome process many suggestions are being urged by various groups. Some of them concern exchange of information among manufacturers, change in patent laws, support of university work by industry, multiplication of facilities for feeding tests, etc., etc., with all of which we can agree to some extent at least. However, the suggestions which need to be considered most seriously boil down to the idea that use of a new agricultural chemical should not be permitted until it has been approved from the health hazard standpoint by the FDA or possibly some other governmental agency. That is, at some point in the chain of development, the governmental laboratory would take over and nothing more should be done until its verdict was rendered. There is no doubt that this could be done, but the question is, *should* it be done?

It is obvious that a health hazard investigation from the standpoint of use in agriculture cannot be made for every chemical found to be promising in laboratory or greenhouse tests, for literally thousands pass such criteria. The situation is a little better with those which survive semi-commercial trials but some hundreds may be counted now and these doubtless will increase greatly in the future. That leads to the next group—those substances which cooperating farmers find useful, and most suggestions are that at this point further development should be stopped until the health question is settled. In order to carry out this plan, the testing facilities of governmental laboratories would have to be expanded on an enormous scale or a host of new university laboratories would need to be established. The expense of such an undertaking would be well nigh prohibitive and in time of straitened finances it would be subject to drastic reduction with consequent curtailing of all progress in this field.

An even more important aspect of such a program is the fact that much of the animal feeding would be relatively useless. Experience in the past shows that of those materials which survive testing by cooperating farmers, a large fraction fail when the general run of farmers undertake to use them and other materials finally prove to be of value only on non-food crops. Every manufacturer of insecticides has a museum in which the almost-rans provide a sobering restraint

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TABLE III

Residues at Harvest Resulting from Practical Control Programs
(all in parts per million)

Produce	*Lead arsenate*	*DDT*	*FHC*	*Parathion*	*Miscellaneous*
Apples	5 to 18	1.1 to 6.3		0.01 to 0.1	5.5 (methoxychlor)
Apricots	5.4	3.7		0.02 to 0.4[1]	3.7 (DDD)[1]
Artichokes				0 to 0.22	
Beans		0.6 to 1.8[4]		0.08[4]	0.3 to 1.4[4] (methoxychlor)
Broccoli		4.8[5] (processed)			
Cabbage		4.2 outer leaves) 1.1 (inner leaves)		< 0.5	
Carrots			0.1 (soil treatment)		
Corn		0 to 0.4[4] (ears) 0 (canned)			
Grapes		9.7 (20 days)[2] 0.9 (108 days)		10.8 (7 days) 0.1 to 0.3 (30 days)	
Olives		20 to 38 2.0 to 3.4 (processed)		0.1 to 0.03	
Peaches		2.7[6]		0.66	
Pears	5 to 18	0.8 to 4.2		0.08	5.7 (methoxychlor)
Peas		Trace		0.01	
Potatoes			0.3 (soil treatment)		
Spinach		2.6 to 4.0			17.4 to 51 (nicotine)[4] 1.6 to 5.1 (nicotine after blanching & wash)
Strawberries		0.6[4]			
Tomatoes		1.0 to 1.7[3] 0 to 0.5 (washed)	0.1 (soil treatment)		1.0 to 1.3 (DDD)[4] 0.5 (washed) 1.8 to 4.8 (calcium arsenate) 0.18 to 0.56 (washed)
Walnut meats				0	

[1] Borden and Madsen, 1949.
[2] Hoskins, 1946
[3] Lamb, F. E., 1946 (personal report).
[4] Robinson, 1949.
[5] Michelbacher, Middlekauff and Akesson, 1948.
Other data are unpublished results from Division of Entomology and Parasitology, University of California.
[6] Barnes, Carman, Ewart and Gunther, 1949.

NACA Elects Hart; Hears Details of Coming F. & D. A. Hearings on Insecticide Tolerances

IN the 16th annual meeting at Spring Lake, New Jersey, September 7–9, the National Agricultural Chemicals Association elected Ernest Hart as its president. Mr. Hart, president of Niagara Chemical Division, Food Machinery & Chemical Corp., Middleport, N. Y., succeeds George F. Leonard, executive vice-president and treasurer, Tobacco By-Products & Chemical Corp., Richmond, Va. The group also elected three new directors at the meeting. They are: Paul Mayfield, Hercules Powder Co., Wilmington, Del.; John Paul Jones, Stauffer Chemical Co., New York; and W. W. Allen, Agricultural Chemical Sales, Dow Chemical Co., Midland, Mich. Mr. Leonard will continue as a member of the Board of Directors.

The subject of toxicology of various insecticides was the chief topic of discussion, although the group heard talks on the world-wide insecticide supply situation, and discussions of distribution and plans for the industry for 1950.

The procedure to be followed in the forthcoming public hearings by the Food and Drug Administration, was described by Thomas B. Bellis, chemist, Division of State Cooperation of the F.D.A. He announced that the hearings will begin early in 1950, and advised the industry to prepare for its part in the testimony to be heard. Mr. Bellis' talk is published in full in this issue. (See page 41.)

Hearings Begin Jan. 17

Definite plans have been made for the F.D.A. tolerance hearings to begin on Tuesday, January 17, 1950. Announcements of the hearing room number and the time of day will be made later.

Panel of Experts Heard

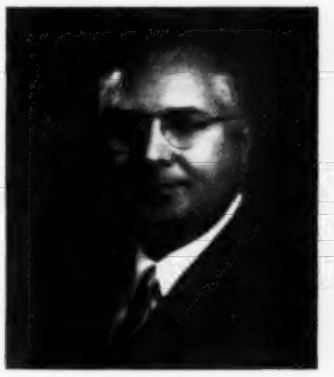
PROMINENT on the program of Wednesday, was the forum on toxicology, under the chairmanship of Dr. Robert A. Kehoe, director, Kettering Laboratory of Applied Physiology, University of Cincinnati, Cincinnati, Ohio. Appearing on the panel, in addition to Dr. Kehoe, were Dr. Henry F. Smyth, Jr., Mellon Institute of Industrial Research, Pittsburgh, Pa., for Carbide and Carbon Chemical Corp.; Dr. L. W. Hazelton, Hazelton Laboratories, Falls Church, Va.; Dr. D. D. Irish, Biochemical Research Laboratories, Dow Chemical Co., Midland, Mich.; Dr. L. C. McGee, Hercules Powder Co., Wilmington, Del.; and Dr. W. E. Dove, U. S. Industrial Chemicals Inc., Baltimore, Md.

Speakers on the panel discussed a large portion of the field of toxicology and pharmacology as applied to the use of agricultural insecticides. Company-supported research was commended, as were arrangements with educational institutions for the answering of numerous toxicological questions. A continuous year after year arrangement is best, Dr. Smyth stated in his talk, and suggested that such investigations may be aided by private consultants as well as by Federal supported laboratories. He estimated that there are about 25 such laboratories in the nation, and that most are now working to their total capacity. This makes necessary the establishment of additional institutions if increased activity becomes necessary. The indoctrination of present educational institutions for the benefit of industry, would also be desirable, he said.

Although there is known to be a considerable amount of work done in such investigations, an accurate estimate is difficult to make, Dr. Smyth pointed out. However, he did venture to guess that "probably from 10 to 20 new agricultural chemicals are investigated each year, but perhaps fifty to a hundred times that number are in some phase of development. As to costs, he said that the development of a successful chemical for agricultural use is far more expensive than to study its toxicology.

Dr. McGee restated for emphasis that many economic poisons are really poisonous, and that the

George F. Leonard
Retiring President



Ernest Hart
Newly-Elected NAC Head

Lea S. Hitchner
Continues as Executive Secty.

American public is clamoring for a *safe* insecticide. This is an unobtainable goal in a great many cases, because if a product is toxic to one species of life, it is likely to be harmful to other species as well. The secret is in proper use of these toxicants, he said, and continued by pointing out that in many cases, familiarity with a toxicant tends to breed contempt for it and leads to danger. He warned against imposing on the margin of safety.

Brought out also in the forum, was the need for keeping in contact with the end user of these toxicants. The manufacturer is very well acquainted with any possible dangers of the material, and the compounder, likewise, is in a position to be careful with and respectful of the material. But when a product reaches the level of the consumer, the one who does the actual application on the farm, there is too frequently a break in the chain of information and this user may make mistakes which are costly. The industry was urged to see that the end user does not disregard cautions.

Along with the numerous warnings to the industry to be careful with its toxicants, was a brighter picture painted by the forum. This was the "exceeding rarity with which accidents occur." One of the speakers recalled that in earlier published reports, some 200 cases of assumed poisoning by DDT, when investigated, resulted in the finding of not one single actual harmful incident which could be traced to DDT!

Industry Views Coming Hearings

Ernest Hart, newly-elected president of the NACA will present a guest editorial in the November issue of Agricultural Chemicals. His subject will cover the view of industry towards the coming FDA tolerance hearings.

Dr. Dove reviewed the history of toxicants, pointing out that during the war years there was little time for study of the effect these materials might have on human beings. The goal then was to control insect pests, and the human risk was calculated to be less than the known losses from allowing insects to go uncontrolled.

Now, however, the industry is engaged in long-time studies covering all of the steps of production down to the end use of these products. Chronic as well as acute toxicity is under serious scrutiny now, as compared to the old days when only acute poisons were given much attention. He commended the cooperation of toxicologists in working out the problems, and told of a number of experiments with rats through several generations to study the effect of toxicants on their progeny.

Urges Pre-Testing

DR. James R. Wilson, secretary of the Council on Foods and Nutrition, American Medical Association, stated in his talk that the industries which contribute to the production of foods must assume the responsibility for the safety of the food which reaches the public. He warned that when accidents occur because of inadequate pre-testing, or from hysteria caused by fear, the stage is set for "hasty investigations and the enactment of hastily conceived laws and regulations which could easily retard real progress."

He pointed out that self-regulation and self-control are essential parts of the democratic way of life, and that the industry must do all possible for itself, leaving the government to do only what is beyond the capacity of industry itself. In this connection, he urged pesticide manufacturers to organize a jointly-sponsored institute which could "correlate the necessary pre-testing of pesticides."

Discussing the subject of toxicology, Dr. Wilson stated that most concern is felt over the day after day intake of toxicants over a long period of time. The danger of such is not confined to the pesticide field, he reminded, since in the past, many have suffered ill-effects from gradual intakes of lead, paint, mercury and benzol.

Dr. Wilson expressed the hope that the process of study will be speeded up, although years will obviously be required to check on all of the possible combinations of materials from a toxicological standpoint. He emphasized that the Council which he represents is not opposed to new developments in the growing, processing and storing of foods, but that safety must be of first importance. He continued by saying that his group is willing to cooperate in the development of new analytical methods to gain more information on both chronic and acute toxicity, and recommended the establishment of a committee on pesticides which will encourage voluntary control.

Pursuing the subject of toxicology further, Dr. J. G. Townsend, chief of the Division of Industrial Hygiene, U. S. Public Health Service, assured his hearers that dangerous chemical products may be used safely on the farm as well as in the factory, if certain fundamental precautions are observed. He said that American industry would be in a primitive stage if it were forced to relinquish the use of certain materials simply because they are toxic. So far as agriculture is concerned, Dr. Townsend said, no significant activity may be carried on without the aid of one or more chemical adjuncts for the control of insects and plant disease.

Emphasizing the fact that the industrial hygienist is interested in protecting the health of the worker from exposures in plants handling these chemicals, he also expressed certainty that any poison, no matter how toxic, may be handled with safety if proper precautions are observed. He used as an example, parathion, which has been the subject of widely circulated bulletins giving explicit instructions for its use and safe handling. Copies of these recommendations have been sent to every state, county and city industrial hygiene unit, he declared, and county agricultural agents have also been advised of these recommendations.

World Supply Situation

THE world insecticide supply situation was discussed by Dr. R. A. E. Galley, Secretary of the British Agricultural Research Council, London. He prefaced his remarks by stating that there is no such thing as a "British view" of insecticide supplies, since the problem of food production is worldwide, and the use of insecticides and other pest control materials has a direct bearing on the supply of food. He warned that the present world population of some 250 billion may reach 300 billion in a few years if malaria is controlled. Productive land is wearing out, he reminded, and there remains urgent need for more rapid effective action. New sources of food are required, as are erosion control and the protection of crops and animals from all kinds of pests. Crops must be protected from weeds, too.

Dr. Galley asked the question why pest control materials are not being used to their fullest extent in the countries where a great deal is known about them. He said that it should not be difficult to determine the potential amounts needed, but making the correct deductions for unknown factors makes such an estimate difficult. Among such factors, he mentioned the reluctance of conservative farmers to utilize something new; the difficulty of application of some pesticides; and confusion about what products to use. Bad publicity has had a deterring effect on many farmers, and not all are convinced that a favorable financial return may be assured from use of new pesticides.

To overcome some of these factors, Dr. Galley suggested that although the agricultural chemical industry in the U.S. needs no vitalization, it might reorient itself to some extent. Instead of going ahead with new products at such a rapid pace, he said, it might be advisable to pursue better public relations, and to give thorough testing to new products. He reiterated that putting new products on the market is dangerous when proper testing has been neglected. "Don't stop putting out new products," he advised, "but be sure everything is known that should be known before they are used on food crops."

Touching on the topic of DDT-resistant flies, Dr. Galley reminded that this material does not control all species of flies. He suggested that a rotation of insecticides be established on an international scale to avoid the building up of resistance in the insects of any given area.

Golf Tournament Winners

W. F. Newton
J. T. Connor
J. A. Singmaster
D. W. Lynch
R. T. Yates
T. W. Frost
L. A. Murphy
F. D. Ferrell
Friar Thompson
Jack Vernon
Jack White
W. H. Hall
Jim Shaefer
Ira P. MacNair

New President Speaks

IN his first address as president of the NACA, Ernest Hart discussed the coming tolerance hearings at some length, urging the industry to cooperate to bring about satisfactory conclusions. He expressed a hope that all groups within the industry will present their cases in the hearings so that the complete picture may be forthcoming.

Manufacturers were urged to maintain strict quality control, and to publish the results of experimental research. Much of the difficulty experienced by the industry of late can be traced to a lack of publicity, he said. The industry was called upon by the new president to continue to do a good job, and to adhere strictly to all regulations which are now in effect and new ones which will become effective following the hearings.

Summing up his remarks, Mr. Hart warned the industry against "fumbling the ball" at this time, since the manufacture, sale and use of pesticides are on the threshhold of a bright decade. "The next two or three years will be the most

(*Turn to page 66C*)

Effective Control of Ribes with 2, 4-D and 2, 4, 5-T

by

H. R. Offord

Bureau of Entomology & Plant Quarantine
U. S. Department of Agriculture

SINCE 1946, 2,4-dichlorophenoxyacetic acid (2,4-D) has been used effectively as an herbicide for the control of three species of *Ribes* in the western white pine and sugar pine regions of the western states.[1] More recently, 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) has been tested and found to be toxic to some species of *Ribes* which were not damaged to any significant extent by 2,4-D.

During the past four years, many papers have been published on the herbicidal properties of 2,4-D, chiefly the results of greenhouse and field-plot tests on weeds common to lawns and fields. Several investigators have been concerned primarily with woody perennials, but only a few published reports[2] have as yet been made available on their work (*1, 3, 4, 13*). The purpose of this report is to summarize the results of experimental and practical work with 2,4-D and 2,4,5-T compounds on ribes and to suggest how these herbicides may be used most effectively to kill these woody perennial plants.

Scope of Experimental Work

THE present summary is based on experimental work with 29 *Ribes species*, (listed later) from the initial greenhouse tests in December 1944, to the late-season observations on field plots in 1948. In greenhouse tests about 500 growth-regulating formulations were applied as sprays, dusts, and aerosols to intact and decapitated plants. From 1945 to 1948, inclusive, 1,364 field plots were established in Idaho, Oregon, and California to test chemicals, equipment, and methods of applying phenoxy herbicides; about 30,000 ribes plants were involved in these tests. The practical 2,4-D spray work done in California and Idaho during the 1946 and 1947 field seasons is summarized in table 1.

Ribes cereum, *R. nevadense*, *R. petiolare*, and *R. roezli* of all ages and sizes are killed by dilute (750 p.p.m. acid equivalent, 0.075 percent) aqueous 2,4-D sprays. At this concentration, the general-purpose spray for selective treatment of ribes contains the equivalent of 10 ounces of 2,4-D acid plus 24 ounces of titanium dioxide marker ("Titanox B-30"), and 1 fluid ounce of spreader ("Tergitol No. 7") in 100 gallons of water.

In the summer of 1948, limited quantities of 2,4,5-T herbicides became available. This was used with apparent success to kill several *Ribes* species that have been resistant to 2,4-D. Dosages and diluents used for 2,4,5-T were based on greenhouse and field tests completed in 1946 and 1947. Throughout this report, unless otherwise specifically noted, comments on hazards, methods, and equipment apply to 2,4-D and 2,4,5-T.

In addition to the spray work with 2,4-D summarized in table 1, many thousand individual ribes plants were decapitated and the freshly scarified crown (the junction of stem and root) treated with liquid concentrate of 2,4-D. This method was used intermittently by

[1] Facilities used by the Bureau of Entomology and Plant Quarantine at Berkeley, Calif., are maintained in cooperation with the University of California, College of Agriculture, through the School of Forestry. Chemical methods and equipment have been approved and utilized in blister rust operations in the Western States by Regional Leaders W. V. Benedict and H. E. Swanson, acting for the Bureau of Entomology and Plant Quarantine, in collaboration with the Forest Service and the National Park Service. The following personnel of the Bureau of Entomology and Plant Quarantine have been directly concerned with the developmental work described in this report: R. T. Bingham, J. F. Breakey, W. S. Burrill, A. London, V. D. Moss, C. R. Quick, F. O. Walters, C. P. Wessels, and L. P. Winslow. Tests have been undertaken and limited field use has been made of 2,4-D and 2,4,5-T in the North Central, Northeastern, and Southern Appalachian Regions under the supervision of Regional Leaders H. N. Putnam, E. C. Filler, and J. C. Ball. Acknowledgment is made of the help given by the Dow Chemical Company in furnishing experimental lots of substituted phenoxy compounds.

[2] A subcommittee on research concerning the eradication of woody plants, L. W. Melander, chairman, compiled and mimeographed an informative group of abstracts for the December 1947 meeting (Topeka, Kansas) of the North Central States Weed Conference.

the regular crews whenever a ribes bush could not be readily pulled or grubbed.

Precautions in Use

Poison and Fire Hazard. 2,4-D and 2,4,5-T are outstanding among the known herbicides with respect to safety from poison and fire hazard. There is no fire hazard associated with the handling or field use of these compounds. There is no poison hazard to man, to animals, or to fish from the dosages of 2,4-D and 2,4,5-T and methods normally used in ribes suppression work.

Mitchell *et al.* (9) tested the poison hazard of 2,4-D to sheep and cows by feeding them on pasturage sprayed with the aqueous acid and by direct administration to a cow of daily dosages of 2,4-D. No harmful effects were noted in either of these experiments. In the dosage tests the cow was fed 5.5 gm. daily for 106 days. 2,4-D was not excreted into the milk of the treated cow, nor was it found in the blood serum of a calf given milk from the test cow. In this same report Mitchell (9, p. 231) notes that a man took 0.5 gm. of 2,4-D acid daily after a meal for 21 days without harmful results. Lynch *et al.*, in a report of the U. S. Department of Interior, Fish and Wildlife Service (February 1947, conclude that 2,4-D is nontoxic to fish in the concentrations usually needed for control of aquatic weeds.

Table 1

Summary of ribes eradication work with 2,4-D sprays in Western States during 1946 and 1947

Equipment used and location	Year of work	Acres covered	Man-days	Gallons of spray	Number of ribes bushes sprayed
Orchard-type truck mounted sprayer:					
California	1946	328	220	40,950	271,398
	1947	1,554	1,455	360,025	1,821,660
Idaho[1]	1947	76	137	18,035	290,350
Hi-Fog applicator:					
Idaho[2]	1947	47	104	66	5,750

[1] Includes work on scattered *R. petiolare* done with 5-gallon knapsack sprayers equipped with trombone pump.
[2] Broadcast treatment of spots selected within an acre.

Care should be exercised in large-scale use of 2,4-D and 2,4,5-T concentrates, especially if either Diesel oil or kerosene is used as a diluent. Some dermatitis may be experienced by persons susceptible to combinations of the oils and ester concentrate. Finely atomized concentrates of the phenoxy esters in oil also may cause respiratory responses of the hay fever type, and some individuals may find it advisable to use a respirator for continuous spray work with oil formulations. In blister rust control work on a large scale, several tons of 2,4-D products have been used during the past 4 years with only minor irritations, such as those noted for the 2,4-D concentrates.

Below: Spraying *Ribes roezli* with aqueous 2,4-D, 750 ppm of acid equivalent, by power methods. String is used to mark lanes for the nozzlemen. (USDA photo)

Damage to Associated Plants

THE principal hazard of 2,4-D and 2,4,5-T is the possibility of damage to other plants closely associated with ribes. Broadly speaking, 2,4,5-T appears to be less selective than 2,4-D in toxicity to many woody perennials. This characteristic of 2,4,5-T can be either an advantage or disadvantage, depending upon the objective. The discussion that follows is the result of extensive field experience with 2,4-D.

During periods of rapid growth, seedling conifers have been damaged and in some instances killed, although in general conifers are much more resistant to 2,4-D than are many of the associated broadleaf shrubs. Saplings over 3 feet tall are rarely damaged significantly by accidental spraying. Fir, hemlock, cedar, yellow pine, and white pine, in the order named, are increasingly resistant to the toxic action of 2,4-D. Less damage to conifers has been observed from the use of the sodium salt of 2,4-D than from the ammonium, triethanolamine, or ester compounds. Willow, hazel, alder, *Ceanothus* spp. and *Manzanita* spp. are among the shrubs that are variously susceptible to damage by 2,4-D and 2,4,5-T sprays. Nevertheless, records from field plots of 1945–48 clearly show that associated deep-rooted perennials are rarely killed by the drift from the spraying of ribes. Ribes plants begin to grow actively and

reach the highly susceptible stage earlier in the growing season than do many of the woody plants with which they are commonly associated. Concentrations of 250 p.p.m. of 2,4-D acid sprayed late in May and early in June will kill close to 100 percent of vigorous fast-growing *R. roezli*, and will do only minor damage to associated *Ceanothus* and *Manzanita*. About a month later these two kinds of brush are more readily damaged.

In areas close to agricultural land special precautions must be taken to avoid damage to highly susceptible plants, such as tomatoes, beans, peas, and cotton, from drift of 2,4-D and 2,4,5-T sprays and dusts. The esters of 2,4-D and 2,4,-5-T are volatile and should be used with great caution near valuable plants or cropland. If damage to associated vegetation is an important factor in some particular area it can be minimized by (1) use of dilute sodium salts, (2) adjustment of concentration of spray to take fullest advantage of the high susceptibility of ribes, (3) use of a spray nozzle of the smallest capacity compatible with efficiency of ribes spraying, (4) choosing the time of year when growth stages of ribes and associated plants show maximum differences with respect to toxic action of the herbicide, and (5) adjustment of the amount of spreader in the spray solution to minimize wetting of plants other than ribes.

Dusts of 2,4-D have been used experimentally on ribes without noticeable damage to conifers or brush nearby.

Effects on Soil

IN forested areas the residual and toxic effects of 2,4-D and 2,4,5-T in the soil may be disregarded, except for action on seed or seedlings of highly susceptible plants shortly after spraying. Harvey and Robbins (*6*) state that 2,4-D compounds are seemingly stable for 6 months in cool dry soils, but lose their toxicity within several weeks in warm moist soils. Crafts (*2*) points out the importance of rainfall in reducing the residual toxicity of 2,4-D in soil. Stability of 2,4-D in soil is probably one of the important factors involved in the establishment of ribes seedlings subsequent to spraying at different times during the season. Significantly fewer seedlings of *R. roezli* were growing one year after midsummer treatment of parent *R. roezli* than after early summer spraying. Lucas and Hamner (*7*) reported that 2,4-D is inactivated rapidly by absorption on activated charcoal. Hanks (*5*, p. 191) showed that solutions percolated through peat soils were relatively non-toxic at the end of 2 weeks and that those from sandy, silt-loam, clay-loam, and sandy-loam soils were relatively free of 2,4-D in 6 weeks. A soil drench of 2,4-D, as a supplement to spraying the foliage of ribes, may thus be less effective in recently burned soils or on heavy muck soils than in light, sandy soils.

Cleaning Equipment

EQUIPMENT used for applying 2,4-D and 2,4,5-T compounds should be thoroughly cleaned before being used for other purposes. It is difficult to remove the last traces of phenoxy herbicides from spray equipment, especially when ester formulations are employed. For sodium, ammonium, or amine compounds, adequate cleansing is obtained with several washings of warm water made alkaline with washing or baking soda. For an ester compound, wash first with kerosene and then with the warm alkaline water.

A solution of household ammonia (2 teaspoons to 1 quart of water) placed in the sprayer overnight should remove all trace of 2,4-D. A more rapid cleaning method consists in rinsing the sprayer for 2 minutes with a 1-percent suspension of activated charcoal.

Susceptibility of Ribes

Species Variation. Ribes species vary markedly in their susceptibility[3] to phenoxy compounds. Several species—*americanum*, *bracteosum*, *petiolare*, and *roezli*—have been killed at favorable periods of the growing season by aqueous sprays containing 250 p.p.m. of 2,4-D acid; others—*lacustre*, *montigenum*, and *triste*—are not significantly damaged by 2,4-D sprays unless excessive dosages are used. Ester-in-oil formulations of 2,4-D

[3] Throughout this section of the report susceptibility is being discussed in relation to the spraying of intact plants. Other methods of applying phenoxy herbicides, such as decapitation and direct treatment of freshly exposed crown and the wetting of intact or sacrified basal stems with oil-ester combinations, are also affected by the factors discussed. For these methods the magnitude of these effects has not yet been fully worked out.

Below: Typical group of mature *R. roezli* killed by spraying with dilute aqueous 2,4-D. (USDA Photo)

may cause superficial damage to foliage and to fast-growing stems of resistant ribes, but later the plants invariably releaf from stems and sprout from the root centers. Of the ribes that are resistant to 2,4-D several of economic importance to the blister rust control work can be killed by 2,4,5-T. Tests with 2,4,5-T are as yet incomplete, but it appears that most *Ribes* species can be killed by 2,4,5-T herbicides; some species may require the use of oil diluents and concentrations of 2,000 p.p.m., or more of 2,4,5-T for satisfactory kill. The *Ribes* species tested are classified according to their general reaction to the toxicity of 2,4-D sprays, as follows:

Highly Susceptible	Moderately Susceptible	Moderately to Highly Resistant
americanum	*californicum*	*binominatum**
bracteosum	*curvatum*	*cynosbati*
cereum	*hirtellum*	*glutinosum*
nevedense	*lasianthum*	*glandulosum*
petiolare	*missouriense*	*inerme**
roezli	*oxyacanthoides*	*lacustre**
speciosum	*sanguineum*	*lobbii**
	setosum	*marshallii*
	viscosissimum	*menziesii*
		montigenum
		rotundifolium
		*triste**
		tularense

For the *highly susceptible* ribes, 90 percent or more of treated bushes of all age classes can be killed at favorable times of the growing season by thorough coverage with dilute aqueous sprays of 2,4-D salt or ester containing 250 p.p.m. or more of 2,4-D acid equivalent. General systemic reaction typical of growth-regulating materials is shown by all species listed in this group.

For the *moderately susceptible* ribes, foliage of plants of all age classes is rather uniformly killed by 1,000 p.p.m. or more of salts or esters of 2,4-D. Ninety-five percent or more of the above-ground stems of all treated plants can be killed, but 50 percent or more of the bushes will be sprouting from the root crown the year after treatment. Bush kill is likely to be restricted to younger plants (non-fruitbearing seedlings). Reactions of plants begin to resemble those previously observed for conventional herbicides.

For the *resistant* ribes, and with sprays of 3,000 p.p.m. of 2,4-D acid equivalent or less, damage is superficial, not extending beyond leaves and succulent fast-growing stems. Some damage may be done to foliage and stems, and varying percentages (usually not more than 50 percent) of young bushes will be killed with concentrates of salts and esters (3,000 p.p.m. or more). Reactions are similar to those of conventional herbicides if concentrations and dosages are high enough.

Even a highly susceptible species such as *Ribes roezli* may fail to react in typical fashion to 2,4-D sprays. On field plots where observation showed all ribes apparently to be in the susceptible growth stage, and where the presence of marker on the foliage after spraying showed thorough coverage, an occasional *R. roezli* survived treatment. Unless varietal forms of a *Ribes* species are involved, the percentage of resistant individuals within a population of a highly susceptible ribes does not usually exceed 5 percent.

Coverage

THOROUGH coverage of all leaves and all stems down to the ground is necessary for uniform and high-percentage kill. Workmen must be especially careful to spray the ends of all branches and to direct the spray over the plant from at least two opposing sides. It is not necessary to wet both sides of the leaves, but attention to the undersurface of leaves will help to insure good general coverage. An unsprayed branch or branch tip usually means the survival of a bush either by a sprout from the crown the following year or by the continued growth of the stem that was missed. Tall, straggling plants are more difficult to spray properly than are low and compact plants. Fully foliated plants generally will be killed more readily than will plants with sparse foliage. The sparsely foliated plants should be given a thorough soil drench about the crown as an auxiliary treatment. Dosage should be increased by an extra drench of the crown for large, fully mature bushes, especially if the growing season is well advanced.

Seasonal Development

IF 2,4-D sprays applied to aerial parts of intact ribes are not effective unless applied during the period of active vegetative growth. Two curves of the figure on page 35, show the difference in susceptibility of young (upper curve) and old (lower curve) bushes to sprays containing 720 p.p.m. applied at different times during the growing season. Notes 1 to 6 on the figure refer to data for plots showing results widely divergent from the kill obtained by a concentration of 720 p.p.m. of 2,4-D on an average mixed-age-class population of *R. roezli*. Plots 1 to 75 were established consecutively as shown, the first test on May 16 and the last on September 26. Because plants vary from one year to another in their seasonal development by calendar date, the effective length of the spray season must be correlated with ocular observations on the age and condition of the plant for each *Ribes* species. Mature plants of *R. roezli* (an upland-type ribes) are susceptible to 2,4-D sprays from the time the leaves are fully expanded and the stems are beginning to elongate in early spring until the fruits are about two-thirds size. When the fruits begin to ripen

* Can be killed by aqueous spray of 2,4,5-T.

and turn yellow the effectiveness of 2,4-D sprays on the older age-class bushes drops to about half its earlier kill. The season for effective spraying of these plants, therefore, is from 4 to 8 weeks, depending on the age and ecologic type of the plants. The spray season on young plants of this species (up to 4 years) is at least one month longer than for mature (fruit-bearing) and old plants. For *R. petiolare* (a stream-type plant), effective kill with 2,4-D can be obtained over a period of about 12 weeks or more, depending on the season.

Variation in kill with seasonal development of ribes appears to be much less marked for 2,4,5-T than for 2,4-D. In 1947 tests, aqueous and oil sprays of 2,4,5-T applied to *R. lacustre* and *R. viscosissimum* in north Idaho early in September killed about the same percentage of plants as July treatments.

Effects of Weather

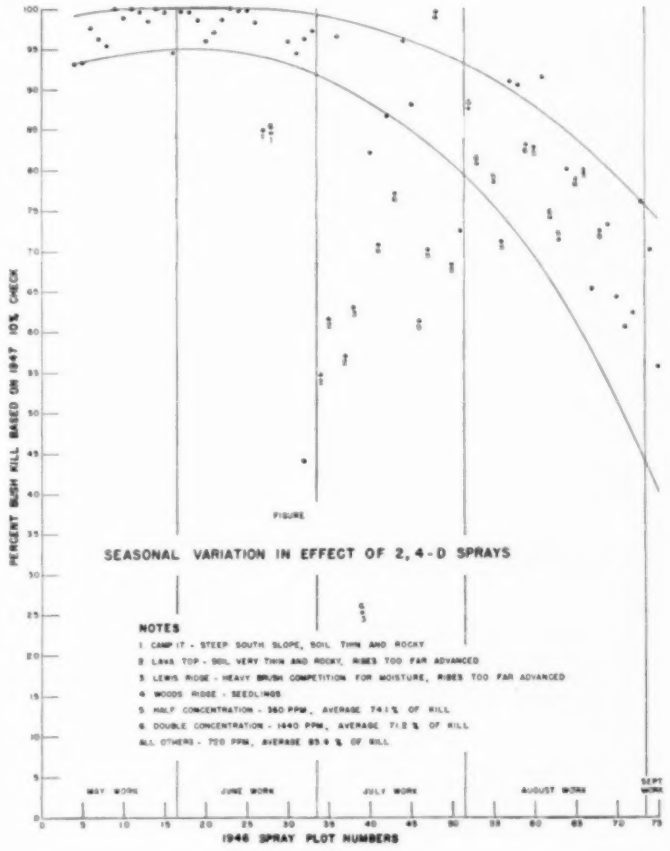
LIGHT, temperature, and relative humidity affect the apparent rate of killing action of 2,4-D, but the final bush kill remains about the same for ribes plants sprayed at the same stage of seasonal development. Ribes in full sun are killed more rapidly than are plants in the shade, but the end result is about the same for both ecologic types. Similarly, high temperatures and low humidity mean more rapid kill than do low temperatures and high humidity, but not necessarily a greater ultimate toxicity. *R. petiolare* has been killed by 2,4-D sprays just as successfully under a canopy of willow and alder as in full sun. In sugar-pine areas of central and northern Sierra Nevadas of California the mean temperatures for three weather stations for May, June, July, and August of 1947 were 58°, 60°, 65°, and 65° F.; for the same months the highs were 85°, 85°, 92°, and 90°, and the lows 30°, 36°, 39°, and 36°. Best results on *R. roezli* in the Sierra Nevadas were obtained during late May and early June, and are attributed to the growth stage of the plant rather than to temperature and light. Payne and Fults (*12*) report activation of the toxic action of 2,4-D by ultra-violet light. Marth and Davis (*8*) held wintercress and plantain sprayed with this compound at controlled greenhouse temperatures of 32°–40°, 50°–65°, 65°–75°, 75°–90°. Killing was definitely quicker at the higher temperatures, but delay at lower temperatures did not affect ultimate toxicity.

Rain seems to have little or no effect on the toxicity of ester formulations of 2,4-D on sprayed plants. Heavy rains within an hour or so of spray work may reduce the killing power of dilute aqueous solutions of the highly soluble ammonium and amine salts. For these materials an interval of 4 hours of dry weather immediately after spraying seems to provide an adequate margin of safety in field work. In practice it is undesirable to spray immediately after a rain when foliage is wet, or during a rain of appreciable intensity. Under these conditions spray men cannot work so efficiently or cover foliage so thoroughly as they can when foliage is dry. The white marker used in sprays for ribes control shows most clearly when sprayed onto dry foliage.

Age & Ecological Conditions

AGE of ribes plants, character of the soil, and vegetative associates of the ribes all have a bearing on the ease with which the ribes can be treated and killed with

(*Turn to page 71*)


PERCENT BUSH KILL BASED ON 1947 10% CHECK
FIGURE
SEASONAL VARIATION IN EFFECT OF 2,4-D SPRAYS
NOTES
1. CAMP 17 - STEEP SOUTH SLOPE, SOIL THIN AND ROCKY
2. LAVA TOP - SOIL VERY THIN AND ROCKY, RIBES TOO FAR ADVANCED
3. LEWIS RIDGE - HEAVY BRUSH COMPETITION FOR MOISTURE, RIBES TOO FAR ADVANCED
4. WOODS RIDGE - SEEDLINGS
5. HALF CONCENTRATION - 360 PPM., AVERAGE 74.1 % OF KILL
6. DOUBLE CONCENTRATION - 1440 PPM., AVERAGE 71.2 % OF KILL
ALL OTHERS - 720 PPM., AVERAGE 85.6 % OF KILL
MAY WORK
JUNE WORK
JULY WORK
AUGUST WORK
SEPT WORK
1946 SPRAY PLOT NUMBERS

How nutrients removed from soil by harvested crops are replaced by Fertilizers

Part I

WHEN a crop is removed from a field, a considerable portion of the soil's nutrients is taken away with it. The seriousness of this procedure depends of course, upon whether or not the supply of nutrients is such that the soil can "afford" such withdrawals without suffering therefrom.

Virgin soils differ widely in their content of plant nutrients, as indicated by maps published by Parker et al (9). Some soils are so low naturally, in one or more nutrient elements, that large additions are essential if the land is to yield satisfactory crop production. On the other hand, some soils are so high in certain nutrients that an attempt to maintain such levels would be uneconomical. Thus, while excessive additions of nutrients in fertilizers and manures over what is removed from the soil may be desirable in most cases, the reverse may be true in other instances.

Of significance also, is the rate at which American farmers are applying fertilizers. Compared to the consumption records of 1930, farmers in the United States are now using more than twice the amount of fertilizer and six times as much limestone each year. The result is not only better crops, but soil erosion has been diminished greatly.

It has recently been shown (1) that cultivated soils of all the important potato-producing areas of the east contain much larger quantities of readily available plant nutrients, especially P_2O_5, than adjoining comparable virgin soils. This indicates that the fertility of some soils is increasing with the passage of years in spite of intensive cultivation. There can be little doubt, on the other hand, that many soils are decreasing in fertility.

The effect of some soil-building and soil depleting factors, as for instance, the amounts of plant nutrients removed in crops, and the amounts applied in commercial fertilizers and animal manures can be estimated from statistics already available. The effects of a number of other factors are very difficult to determine. For example, the formation of new soil material by weathering of minerals would be extremely difficult to evaluate, although it is known to be of importance. This paper is devoted primarily to a summary by regions and states of the 1947 data for Nitrogen, Phosphoric acid and Potash removal by harvesting crops and additions by applications of fertilizer and manure. The relative importance by regions of other factors relating to fertility trends is discussed briefly.

Losses by Soil Erosion

IN agricultural soils, the N content of the surface soil is generally greater than that of the subsoil. When a soil has been fertilized over a period of years the P_2O_5 content is also apt to be higher. Losses due to erosion are therefore especially serious for these two nutrients. Damage to cultivated lands by erosion is least in the New England region, where a large proportion of the farm land is maintained in grass or other sod crops. Erosion losses are somewhat greater in the Middle Atlantic states, and represent a serious problem in the South Atlantic region, particularly in the Piedmont and mountain areas. Erosion losses are only moderate in the East North Central region, while during drought periods, wind erosion losses may be severe in the West North Central and West South Central regions. Erosion in the mountain and grazing areas of the Western region is often severe, but is usually slight on cultivated lands in this region. Although soil erosion losses may still be serious locally, losses in

(1) Contribution from the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture, Beltsville, Md. Received for publication, 1949. A summary of this paper was presented at the Fertilizer Division, Meeting of the American Chemical Society, Sept. 2, 1948, Washington, D.C.

by

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nearly all of the regions have been decreased during recent years by contour cultivation, strip cropping, terracing, and other sound soil and water management and conservation practices. This topic is discussed in detail by Utz and his coworkers (19).

Losses by Leaching

OF the applied nutrients here considered, danger of leaching is greatest in the case of N. As soil organic matter is decomposed slowly, many soils contain fairly large reserves of slowly available N that is not readily lost by leaching. Annual losses of N in humid areas, estimated in lysimeter experiments, vary from a few pounds per acre from heavy soils covered with trees, grass, or close growing crops, to as much as 100 pounds of N per acre on bare sandy soils which have been fertilized heavily.

Added soluble P_2O_5 is almost always precipitated in soils, and is usually held in combination with either the clay or organic colloids, or with both fractions. This P_2O_5 is thereby made available to plants more slowly. Analyses of lysimeter leachates, ground waters, and rivers (19) indicate that the loss of P_2O_5 by leaching from agricultural lands is negligible, except for very limited areas of heavily phosphated sandy soils (1).

Although many soils contain as much as 2 percent K_2O, the solubility of these K_2O minerals is extremely low. The more readily available K_2O is held by the base-exchange complex. Potash leaching losses are largest from soils of the humid region that are low in clay and organic matter content, and have been heavily fertilized with K_2O.

Loss of applied nutrients by leaching is greatest in the South Atlantic and South Central regions, considerable in the Middle Atlantic states, somewhat less in New England and the East North Central regions, and quite small in the west, except for some of the lighter textured irrigated soils.

Loss by Harvesting Crops

THE quantities of N, P_2O_5, and K_2O removed from the soil by the harvesting of crops have been variously estimated, as shown in Table 1. The first two estimates in the table include the nutrient content of plant residues that are returned to the soil normally. The later estimates do not include plant residues that usually remain on the land.

Table 1 also indicates that crop production has been increasing and the proportions of the various crops have been changing over the period of years represented by the data. As indicated, the first two studies include some crop residues not tabulated in the later ones. The results of the four studies therefore seem to be consistent.

The average number of pounds of nutrients removed per acre of land in harvested crops as determined in the present study is summarized by regions in Table 2. The total tonnages are given by states in Appendix Table 1* These estimates do not include removals from forests or pastures.

The N figures in Appendix Table 1 are given for both legumes and non-legumes. Only the non-legume N content, however, is considered as removed from the soil for purposes of this study because more N is fixed from the air in connection with the growing of legumes than is found in the harvested portions of legume plants. It may therefore be assumed safely that removal of the N contained in the harvested portions of legumes does not deplete the available N supply in the soil. For the United States as a whole, approximately one-third of the total N in harvested crops is in the form of legumes. Non-legumes account for more than two-thirds of the total N removed in crops in the West North Central and South Central Regions and for less than two-thirds in the other regions.

Gains of Nutrients

1. *Soil formation* involves the weathering of soil minerals by chemical, physical and biological processes. These changes transform unavailable plant nutrients to forms available to plants and result in the gradual renewal of

* To appear in Part II, next issue.

TABLE 1

Annual plant food removal from U. S. soils by harvested crops.

Item	Lipman and Conybeare (4)[3]	BPISAE[1,2]	Stallings (13)[3]	Mehring and Parks[2]
Period covered	1930	1000 tons 1927–1936 av.	1943	1947
Nitrogen in legumes	[4]	1,337	1,854	1,764
Nitrogen in non-legumes	[4]	3,774	3,174	3,446
Nitrogen, total	4,611	5,111	5,028	5,211
Phosphoric oxide, P_2O_5	1,592	1,773	1,709	1,815
Potash	3,186	3,982	2,929	3,060

[1] Includes parts of plants not usually removed from the land, such as corn, cotton, and tobacco stalks, potato and tomato vines, leaves and new wood of fruit trees, etc.
[2] Previously unpublished.
[3] Excludes nutrient contents of crop residues that are usually returned to the soil.
[4] Not given separately.

TABLE 2

Nutrients removed from the soil in 100 principal harvested crops, 1947.

Region[1]	Million acres in harvested crops	Average pounds per acre removed		
		N	P_2O_5	K_2O
New England	3.6	29	13	43
Middle Atlantic	16.4	22	13	30
South Atlantic	24.0	15	8	15
East North Central	59.8	21	13	20
West North Central	133.7	20	10	13
East South Central	22.9	15	9	16
West South Central	52.8	16	7	10
Mountain	24.6	22	12	28
Pacific	15.1	27	15	38
United States	352.9	20	10	17

[1] For states included in each region see Appendix Table 1.

available nutrient supplies from the large reserve contained in most soil materials. Geological or very slow sheet erosion is a part of the normal process of soil formation, and at a slow rate is desirable because the accumulation of all the by-products of soil weathering results in soils of poor physical properties. Sheet erosion usually exposes to the weathering process additional unweathered soil-forming minerals.

2. *Rainfall* always contains combined N in solution. This comes from 1, the burning of coal, 2, electrical discharges, such as lightning and 3, various biological processes.

The quantities of N in annual rainfall (3) range from 1.4 pounds per acre in very sparsely populated western areas, to more than 10 pounds per acre in farm areas in industrial states. The usually accepted average of 7 pounds per acre is equivalent to 1,219,242 tons of N on the harvested crop land of the United States. Probably more than half of this amount is deposited on land east of the Mississippi and north of the North Carolina-Virginia line, extended westward.

3. *Ground water moving upward* brings plant nutrients dissolved from deeper layers into the feeding zone of plants. As this movement is appreciable only where the soil water is in contact with a ground water table, the effect is important only in a limited number of humid and irrigated soils.

4. *Plants* such as cotton, fruit trees, alfalfa, sweet clover, and many other deep-rooted crops, as well as weeds, feed not only in the topsoil but also in the subsoil and sometimes in the layers below the subsoil. Decomposition of root and top residues of such plants releases in available form into the surface soil, nutrients that come from deeper layers.

5. *Bacteria* in the roots of inoculated legumes fix atmospheric N in forms available for assimilation by plants. Most legumes, especially deep-rooted legumes and those used as green manure crops, obtain enough N from the air for their own growth, and usually provide in the form of crop residues, additional quantities for the benefit of succeeding crops grown on the same land. Erdman (2) gives the following as the average quantities of nitrogen fixed in the growing of the crops shown, when properly inoculated.

Crop	Pounds N a
Canning peas	132
Sweet clover	117
Alfalfa	100
Red clover	89
Cow peas	86
Soy beans	63

Non-symbiotic fixation is also a minor source of N in certain soils of the Central and Western states.

6. *Applications of fertilizers* to crops are estimated to supply on an average the quantities of plant nutrients given in Table 3, and on an acre basis by regions and by states in Appendix Table 2. Appendix Table 2 also indicates the deductions that have been made in the figures of Table 3 for the fertilizer used on pastures.

Rates of fertilization and manuring vary greatly between regions, and within states. In a given general farming region rates of fertilizer use tend to have a normal distribution. One factor which would have given a skewed distribution, namely low rates of fertilization on pastures, has been eliminated in this study. High rates of application to truck and specialty crops, which skew the distribution in the other direction have not been eliminated. Hence the average use per acre of fertilizers in Florida and California and probably a few eastern seaboard states, although correct, represents averages of figures not having normal distribution.

Well over half the fertilizer ni-

TABLE 3

Average amounts of nutrients in fertilizers applied to each acre in harvested crops in 1947.

Region	N	P_2O_5	K_2O
		Pounds per acre	
New England	13	28	22
Middle Atlantic	7	26	13
South Atlantic	20	41	25
East North Central	2.0	16	6
West North Central	0.3	2.0	0.5
East South Central	11	18	8
West South Central	2.4	4	1.1
Mountain	1.0	3	0.2
Pacific	15	9	4
United States	4	10	3

trogen used in the United States is applied to soils in the South Atlantic and South Central regions. On a per acre basis, the South Atlantic, Pacific and New England regions use most and the West Central and Mountain regions least.

Phosphate use in the South Atlantic and East South Central Regions accounts for nearly half of the P_2O_5 applied as fertilizer. The New England, East North Central and Middle Atlantic regions are also large users of P_2O_5. The West Central and Mountain regions use relatively little per acre of harvested crops.

Average application rates of K_2O are highest in the South Atlantic and New England regions, somewhat less in the East South Central and Middle Atlantic regions and very low in the West North Central, West South Central and Mountain regions. Some of the soil and agronomic reasons for these large differences in fertilizer use in the various regions will be discussed later in this article.

7. *Applications of manures* supplied the quantities of nutrients to harvested crops in 1947 given by regions in Table 4. These values were derived from estimated manure production and utilization given in Appendix Table 3,** by states and regions, and from estimated nutrient contents of the average farm manure as applied to harvested crops, by regions, Appendix Table 4. The Appendix also contains a short summary of the sources of information, and the methods by which these figures were calculated. The tonnages of nutrients apply to manures as removed from stables, barnyards and chicken houses. They allow for losses in storage but not for additional losses that may occur in spreading on the land or thereafter. Nutrient application rates in the form of manure are highest in the New England, Middle Atlantic and East North Central States and lowest in the South Atlantic and South Central states (Table 4). The population of farm animals is low in the Southern region, and in several of the southern states less than 1 percent of the manure produced is applied to harvested crops. This is in contrast to more than 50 percent utilization in certain of the northeastern states. The low percentage of manure applied to crop land for the southern states is due in part to the fact that in this section farm animals are seldom confined in barns or pens where the manure can be collected.

** Appendix will appear in full next month.

TABLE 4

Average amounts of nutrients in animal manures applied to each acre of harvested crop land in 1947.

Region	N	P_2O_5	K_2O
		Pounds per acre	
New England	29	16	25
Middle Atlantic	24	15	21
South Atlantic	1.6	1.0	1.4
East North Central	17	11	15
West North Central	5	3	4
East South Central	1.9	1.1	1.7
West South Central	.4	.2	.4
Mountain	10	6	9
Pacific	6	3	5
United States	7.4	4.5	6.2

Relative Importance of Manures and Fertilizers

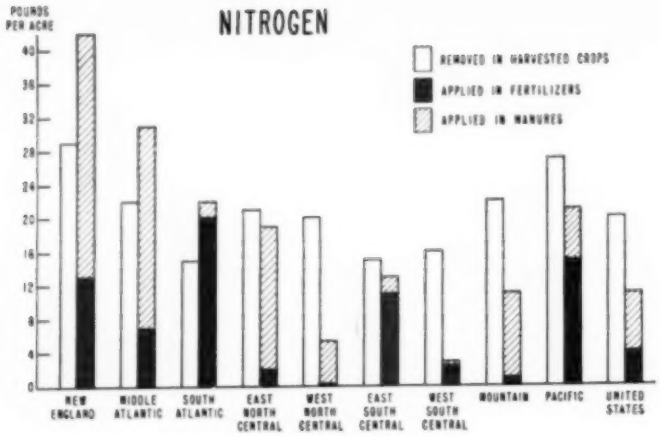
MANURES and fertilizers play very different parts in supplying plant nutrients in the various regions of the country. For example, the South Atlantic states account for over 32 percent of the total tonnage of commercial fertilizers but for less than 2 percent of the manure used in the United States. The use of commercial fertilizers is also relatively high in the Middle Atlantic and East North Central states, but in these regions very large quantities of manure are also used. The data in Table 5 illustrate the relative contribution of fertilizers and manures, in furnishing N, P_2O_5 and K_2O to crop land. Commercial fertilizers provide 93 percent of the N applied to harvested crops in the South Atlantic region, 88 percent in the East South Central region, 85 percent in the West South Central region, and 73 percent in the Pacific region. For the remainder of the country, commercial fertilizers supply less than one-third of the total N added to harvested crop land in these two forms.

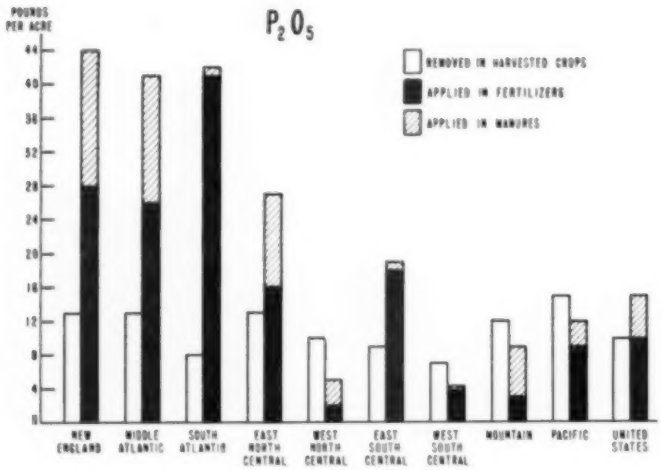
TABLE 5

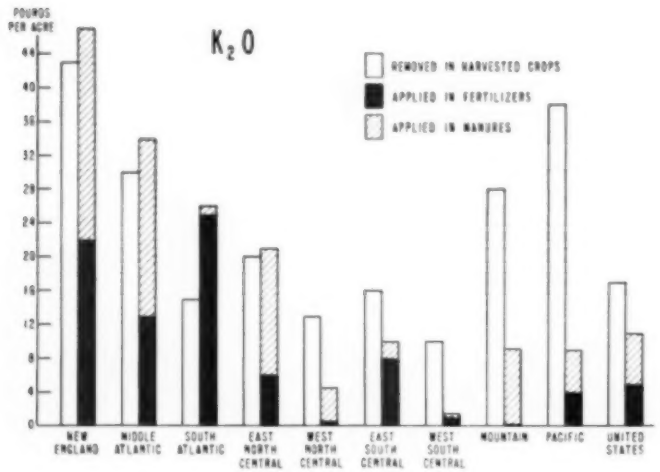
Relative importance[1] of fertilizers and manures in furnishing nutrients applied to harvested crops.

Region	Proportion of applied nutrients from commercial fertilizers		
	N	P_2O_5	K_2O
	Percent	*Percent*	*Percent*
New England	31	63	47
Middle Atlantic	24	64	38
South Atlantic	93	98	95
East North Central	10	60	30
West North Central	7	41	12
East South Central	88	95	86
West South Central	85	94	74
Mountain	9	35	2
Pacific	73	74	46

[1] Derived from data in Appendix tables 2 and 3.







The relative contribution of manures and commercial fertilizers to the maintenance of K_2O supply in the various regions is similar to that for nitrogen, but with a slightly greater proportion of K_2O being derived from commercial fertilizers in the East and a lower one in the West. These differences reflect the favorable K_2O-supplying power of soils in the Western region.

Commercial fertilizers supply most of the P_2O_5 added to crop land, except in the West North Central and Mountain states. This is due to the generally low content of P_2O_5 in manures and most crops (Table 2), the high content in mixed fertilizers and to the use of separate phosphate fertilizer materials on a relatively large scale.

The dairy and poultry industries are more important than other types of farming in the Northeastern states and much of the land is in pasture and hay. Since the calculations in this paper apply only to harvested crops, plant nutrients moving from pastures to cultivated lands as manures add to the favorable balance for cultivated land. In regions of intensive dairying, too, a large part of the plant food in animal excrements is derived from feed produced in other states.

Part II of this article is scheduled to be published in the November issue of *Agricultural Chemicals*. The second installment will cover the replacement of plant nutrients, with quantities of nitrogen, phosphorus and potash in commercial fertilizers. Complete tables will be presented with figures showing the amounts of soil nutrients removed from the soil by various crops in different parts of the country.

The graphs on this page are self-explanatory. They show the relationship between amounts of nitrogen, phosphoric oxide and potash removed from the soil in harvested crops, and that applied in fertilizers and manures.

Food and Drug Administration's Advice to Insecticide Industry:

Prepare For Tolerance Hearings

By

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IT seems logical that a gathering of the insecticide industry* should be interested in knowing the role to be played by the Food and Drug Administration in the forthcoming tolerance hearings. There is truly a job to be done, so the purpose of this talk is to discuss ways of doing it.

Some confusion exists about whether the Food and Drug Administration is to act as judge, jury and prosecutor in the hearings; and whether or not the rules which come out of the hearings will be real laws, or mere opinions. It is well to clear the air with a straightforward presentation of what lies back of the hearings, the reasons why such procedure seems necessary, and what will be done about it.

Contrary to some conceptions of the matter, regulation-making is not a judicial proceeding. Under section 406(a), it is a *legislative* proceeding. It is rule-making. It does not adjudicate rights between adversaries arising out of past conduct, but instead, it develops rules to govern future conduct. As an analogy, perhaps the proceedings before committees of the Congress or of state legislative bodies in hearings on bills, furnish an example.

Issues are not narrowly drawn. Instead, considerable latitude is permitted the many parties interested in the proposed measure to present their different points of view. A lawsuit determines which party wins and which party loses, but a rule-making hearing makes no such determination. To the extent that the rule developed is a good rule all parties win. Sometimes a lawsuit can be won by suppressing evidence, by holding back or springing a surprise, by holding the cards close to the belt. Such techniques are *not* good legislative practice. Mr. Crawford, Deputy Commissioner of Food and Drugs, has reported that Senator Copeland, who sponsored the Federal Food, Drug, and Cosmetic Act of 1938 often stated, "You can't legislate off in a corner." We can't write good tolerances under section 406(a) "off in a corner." We must gather together in the hearing room around the council table and present our facts freely and openly. Each card must be placed face up on the table so that we can all appraise it with care.

In the eleven years since Congress enacted the Federal Food, Drug, and Cosmetic Act we have had considerable experience in rule-making hearings. We are well aware of the criticisms which have been made of these hearings. These criticisms were aptly epitomized by one friendly critic who observed in reference to the hearings, "there is too much 'lawyering' in them!" I am sure that what he had in mind was action more characteristic of a police court lawyer than of the legislative counselor. Speaking of means for improving our rule-making hearings, Mr. Crawford has said,

> "We can avoid some of the needless controversies that occur at hearings. While acknowledging that cross-examination is a valuable tool for crystallizing and delineating the facts on which the Administrator must act, we can try to give to the hearings more of the studious atmosphere of a fact-finding proceeding, which it is, and less of the din of embattled adversaries. These things cannot be done in an atmosphere of fear, distrust and unrealistic forebodings. The purpose of the law is to provide good and workable standards. That purpose cannot be achieved by the Government alone. It necessitates wholehearted and intelligent work by the food industries, tempered and guided by good judgment, a high sense of public responsibility, and vision of a future rich in its promise of progress." (3 F.D.C. Law Quarterly 243, 254).

Background Pictured

BEFORE speaking of the steps in the procedure leading up to the establishment of regulations under section 406(a) of the Food, Drug, and Cosmetic Act, it may be worthwhile to recall something of the background of that section. The Food and Drugs Act of 1906 carried no authorization for the promulgation of legally binding tolerances for added poisons in food. That law did declare an article of food "shall be deemed to be adulterated . . . if it contain any added poisonous or other added deleterious ingredient which may render such article injurious to health." While the 1906 Act was in effect, informal tolerances were announced for lead, arsenic, and fluorine as insecticidal residues. These informal tolerances were valuable as indicating when the general provisions of the Act of 1906 would be invoked but since they had no legally binding effect they left open for litigation in the courts, each time an action was brought, the question of whether the particular amount of added poison on the food might render it injurious to health. This did not afford adequate consumer protection because it did not take into account the probable intake of the same poison or of similar poisons from other sources. In developing the Act of 1938 to replace the 1906 statute,

* Paper presented at the Annual Meeting of the National Agricultural Chemicals Association, Spring Lake, N. J., September 9, 1949.

Congress made it abundantly clear that the general purpose was to set up effective provisions against abuses of consumer welfare growing out of inadequacies in the law of 1906. In the new law Congress declared a food to be adulterated if it contains a poisonous or deleterious substance which may render it injurious to health; or if it contains *any* added poisonous or deleterious substance not required in the production of the food or capable of being avoided by good manufacturing practice. The new law also provided for the situation where poisonous or deleterious substances are required or are incapable of being avoided, by authorizing the Administrator to prescribe tolerances by rule-making procedure, and the law declares foods adulterated when the tolerance is exceeded. In prescribing tolerances the Administrator must take into account the extent to which the poisonous or deleterious substance is required or incapable of being avoided in the production of the food and also the other ways in which consumers may be affected by the same or other poisonous or deleterious substances. In any event, the Act enjoins the Administrator to prescribe the tolerances at such levels as will protect public health. In a report on the bill which became the law of 1938 the House Committee stated,

> "Section 406, in subsection (a), provides for a fairer and more effective control of the addition of poisons to food than does the present law. This subsection first prohibits the unnecessary addition of poisons. Where such additions are necessary, the establishment of tolerances is authorized, based upon the practical necessities for the use of poisonous substances. It is well recognized that an adequate fruit and vegetable supply could not be brought to maturity without the use of toxic insecticides and fungicides. But the situation is made extremely complex by the number of poisonous substances used for different crops in different localities, and by contaminations which unavoidably occur in many manufacturing processes. The purpose of the subsection is to insure that the total amount of poisons the consumer receives will not be sufficient to jeopardize health. The needs of each branch of the food-producing industry can be met and the public health can be adequately protected." (H.R. Rep. No. 2139, 75th Cong., 3rd Sess., p. 6)

The courts, in construing the 1938 Act, have given recognition to the expressed intent of Congress that this Act should extend greater protection to consumers. For example, in one of his opinions, Mr. Justice Frankfurter declared:

> "The Food and Drugs Act of 1906 was an exertion by Congress of its power to keep impure and adulterated food and drugs out of the channels of commerce. By the Act of 1938, Congress extended the range of its control over illicit and noxious articles and stiffened the penalities for disobedience. The purposes of this legislation thus touch phases of the lives and health of people which, in the circumstances of modern industrialism, are largely beyond self-protection. Regard for these purposes should infuse construction of the legislation if it is to be treated as a working instrument of government and not merely as a collection of English words." (U.S. v Dotterweich, 320 U.S. 277, 280)

It is appropriate to our consideration of procedure to call attention to another section of the Food, Drug, and Cosmetic Act. In section 701(e) Congress outlined in some detail the procedure to be followed by the Administrator in regulation making. Much of this procedure centers around the public hearing which is required to be held before the regulations contemplated by some 10 different sections of the Act are issued, amended or repealed. One among these sections is 406(a).

Section 701(e) provides two means for starting regulation-making proceedings. The Administrator can announce a hearing on his own initiative or upon an application stating reasonable grounds from an interested industry or a substantial portion of an industry. The hearing is announced by the publication of a notice in the Federal Register. This notice must be published not less than 30 days before the date set for the hearing. In addition to announcing the date and place of the hearing this notice announces what the hearing is about by setting forth a proposal in general terms. At the hearing any interested person has an opportunity to be heard. A record is made and it is upon the substantial evidence in this record that the Administrator bases his order in the matter of the regulation.

It should be our mutual objective in our hearing under section 406(a) to build up a record replete with facts established by reliable, probative and substantial evidence.

As already stated, we have had considerable experience with rule-making hearings under the 1938 Act. That statement should be amplified by adding that most of our experience in rule-making has been gained in hearings for establishing food standard regulations under section 401 of the Act. However, section 701 provides the same procedure for section 401 regulations as for section 406(a) regulations. We have had only one hearing for developing regulations under section 406(a). That was the hearing held for the purpose of establishing a regulation limiting the quantity of fluorine remaining as insecticidal residues on apples and pears. That hearing was held in 1944. The regulation which was issued set the tolerance for fluorine remaining as insecticidal residue on apples and pears at 7 milligrams per kilogram of fruit. This tolerance was rendered ineffective by a decision of the Ninth Circuit Court of Appeals construing the regulation as restricted in application to fluorine in its elemental state. There is no reason to blame this result on the procedure which was followed. The slip-up in the fluorine regulation was one of draftsmanship. Perhaps had the regulation been worded "The quantity of fluorine *in any compound* remaining as insecticidal residue . . ." it would have been construed altogether differently by the court.

Preliminary to rule-making there must be a recognition of the need for the rules to be established. This involves the collection of data and exchange of ideas. As examples of preliminary steps, your attention should be called to the address on the subject "Addition of Chemical Substances to Foods" which was delivered by Dr. White, Chief of our Food Division, before the Association of Food and Drug Officials in June 1940. (10 *Bul. Assn.*

(*Turn to page 66C*)

American Chemical Society Presents Many Papers on

Fertilizers and Pesticides

IMPORTANT phases of pesticides and plant nutrients, were discussed at the 116th meeting of the American Chemical Society, Atlantic City, N. J., from September 18–23. The Division of Fertilizer Chemistry convened on Monday afternoon and continued its sessions on Tuesday and Wednesday. The section on Economic Poisons, under the Division of Agricultural and Food Chemistry, was held Wednesday morning.

Dr. Jackson B. Hester, Campbell Soup Co., was chairman of the Division of Fertilizer Chemistry, and Dr. Vincent Sauchelli, Davison Chemical Corp., Baltimore, secretary of the Division, presided at the opening session on Monday. Trace elements were covered in a number of papers presented at the meeting. The molybdenum content of some common fertilizer materials was discussed in a paper by H. E. Evans, E. R. Purvis and F. E. Bear, Rutgers University. R. W. Ruprecht, Central Florida Experiment Station, Sanford, Fla., asked the question, "Should trace elements be added to commercial mixed fertilizer" in his paper. He answered negatively, pointing out that trace elements are not needed in the majority of soils, and that there is danger of applying toxic amounts of these minor elements. Quicker results with smaller amounts of material are obtained by spray applications, he stated.

Dr. A. A. Nikitin, Tennessee Corporation, Atlanta, Ga., pointed out the value of visible symptoms of trace element deficiencies in plant growth. He declared that the chemical analysis of soils is not entirely sufficient since the relationship between the elements is more important than the value of each element by itself. He said that deficiencies may be estimated from visible symptoms on plant foliage in the case of some trace elements.

The treatment of foliage with sprays or dust has given quick results, he said, and the method eliminates interference from the soil. The results are fast enough to protect plants when deficiency symptoms have been discovered during early growth.

Visible deficiency symptoms may be used, in specific cases, to evaluate relationships between various elements important to growth. Boron, for instance, may be toxic to plants in the presence of a large amount of potassium. On the other hand, even larger amounts of boron in the soil may not harm plants if a sufficient amount of calcium (lime) is present. Dr. Nikitin concluded that it would be impossible to secure by analytical methods, enough information to establish this relationship between boron and calcium on various soils.

Scientific tests on the value of mineral elements and nitrogen in manure, as compared with manure alone, were reported by Dr. Hester. He told of growing test tomatoes and other vegetable crops under three separate sets of conditions. On the first plot a moderate amount of fertilizer was applied; on the second, the same fertilizer plus two tons of dried manure; and in the third test, the same fertilizer plus a sidedressing of the mineral elements and nitrogen from soluble salts equivalent to that of the manure.

Results, Dr. Hester reported, indicated that although increases in yield were noted with the application of manure, a better increase came with application of the mineral elements and nitrogen supplements.

John O. Hardesty and Rikio Kumagai, U. S. Department of Agriculture, Beltsville, presented a paper discussing the properties of fertilizer conditioning agents. Tests of various plant residues, organic and inorganic waste by-products from industrial processes and a number of natural inorganic materials such as clay, diatomaceous earth, vermiculite and rock dusts were reported. These studies revealed wide differences in the chemical and physical characteristics of the various materials.

No conclusions were drawn, but the data will serve to classify conditioning agents on the basis of these characteristics, the paper stated.

The Tuesday morning session, with Dr. Sauchelli presiding, took up the role of sulfur in agriculture. Dr. W. W. Duecker, Texas Gulf Sulphur Co., Inc., New York, set the stage with an address on "Sulfur and Life," pointing out how the element improves soil structure, increases its water-holding capacity, modifies soil reaction and stimulates growth of soil microorganisms. "Humans and animals are entirely dependent for their sulfur supplies on the complex organic sulfur-containing compounds," he declared.

He pointed out that with the development of new analytical research methods, attention was focused on the role of sulfur in the soil, and its relationship to plant

and animal nutrition. New research techniques involving radioactive sulfur and tracer materials are now being used to accelerate the study, he said.

Sulfur Talks Continue

THE symposium on sulfur continued Tuesday afternoon, with Dr. Hester presiding. Dr. A. B. Groves, Virginia Agricultural Experiment Station, discussed the role of sulfur fungicides in fruit production, emphasizing the elemental sulfur products available as pastes, as dry wettable products, and as dusts. He reminded that sulfur fungicides are used on apples primarily for control of scab, and on the stone fruits for control of brown rot.

The action of sulfur is apparently in the form of hydrogen sulfide, evolved from interaction between sulfur vapor and living fungal and plant tissue. Effectiveness of sulfur is positively correlated with the fineness of division of the product, he said, and continued by stating that a good sulfur fungicide should be as fine as possible.

The elemental sulfur fungicides are generally compatible with many of the new organic insecticides, in contrast to the situation with formerly standard fungicides and additives, use of which was severely limited because of compatibility difficulties.

Dr. Sanchelli presented a survey paper on sulfur in the U. S. fertilizer industry, reporting that agriculture is the largest consumer of sulfur in the form of plant nutrients, as a fungicide, and particularly as a raw material in the manufacture of superphosphate and sulfate of ammonia. Equal weights of rock phosphate and of 50 Be°. sulfuric acid are required to produce superphosphate, of which more than 10 million tons (18 percent basis) were produced in 1948. Fertilizer manufacture consumes about one-third of the country's total production of sulfuric acid.

A. L. Mehring and Gae A. Bennett, U. S. Dept. of Agriculture, Beltsville, prepared a paper on sulfur in fertilizers, soil amendments and manures. Looking back over the records of the past century, the authors stated that in 1850, fertilizer application accounted for only about 1,000 tons of SO_3 in U.S. soils, as compared to 3,315,000 tons in 1947. Liming materials accounted for 2,000 tons of SO_3 a hundred years ago, while in 1947, the total was 115,000 tons. The record for animal manures is 282,000 tons in 1850, against 804,000 tons in 1947. "Thus in a century, the quantity of sulfur added to the soil in such materials increased nearly nine-fold," the authors said. In addition to that, they continued, the quantities of sulfur added to the soil as a result of smelting sulfide ores and burning coal have also increased.

Potash Picture Presented

PRESENTATION of more fertilizer papers continued Wednesday morning, with Dr. Hester presiding. Among the speakers was Dr. J. W. Turrentine, American Potash Institute, Washington, D. C., who gave a progress report on potash production in the U.S. He stated that deliveries of potash during 1948 amounted to 2,134,000 tons of potash salts, equivalent to 1,134,000 tons K_2O, representing an increase of some 300 per cent during the past ten years. Great progress was made during 1948 in the installation of enlarged mining and refining facilities for expansions in production, particularly of the 98 per cent grade of potassium chloride. These represented an expenditure of some $6,000,000, but resulted in greatly increased supplies.

Progress has also been made in distribution, both geographically and agronomically, with deliveries made into 45 states and the District of Columbia for use on a wide variety of crops, Dr. Turrentine reported. Outstanding increases in use in certain states indicate the development of a wider market for American potash, and a market less subject to influence by changing conditions in the agricultural economy, he stated.

W. B. Andrews and Marvin Geiger, Mississippi Agricultural Experiment Station, were authors of a paper dealing with problems and chemistry of direct application of anhydrous ammonia to the soil. They estimated that some 1,000,000 acres in Mississippi were fertilized with anhydrous ammonia during the fiscal year ending June 30, 1949. This compares with application to 90,000 acres during 1947, when the use of liquid fertilizer was first introduced in the state.

When anhydrous ammonia is applied to the soil, it combines with the clay and organic matter to make solids. Ammonia replaces hydrogen easily, and it may also replace other cations. The pH of the soil is a primary factor in determining the rate of nitrification. On soils with a pH of 5 or less, the rate of nitrification is slow, so that anhydrous ammonia may be applied in October as well as in March. On soils with a pH of 5.5 or higher, the rate of nitrification is high and if the liquid material were applied in October, it would be converted into nitrates and leached out of the soil before spring.

It should be remembered, the authors stated, that the liquid phase of anhydrous ammonia is at its boiling point at all temperatures, and it boils if the pressure is reduced. It therefore does not behave as a liquid nor as a gas, which must be taken into consideration in metering it. Four ways were suggested for metering on tractor equipment: 1) regulating valve and pressure gauges, 2) needle valve and pressure gauges, 3) rotameter and 4) pump. The last method is geared to the tractor, while with the first three methods metering is on a time basis.

Non-farm use of fertilizers was discussed in a paper by Walter Scholl and Hilda M. Wallace, U.S.D.A., Beltsville, Md. About one per cent of all mixed fertiliz-

(*Turn to page 66A*)

National Shade Tree Conference Discusses Use of Chemicals in

PEST CONTROL

Dr. Ray R. Hirt
President, Nat'l Shade Tree Conference

MEMBERS of the National Shade Tree Conference held their 25th annual convention at the Lord Baltimore Hotel, Baltimore, Md., August 22-26. R. R. Hirt of the Department of Forestry of Syracuse University, Syracuse, N. Y., was elected as the new president of the conference, his post as vice-president being filled by the election of E. W. Higgins, Frost & Higgins Co., Arlington, Mass. The retiring president is Norman Armstrong of White Plains, N. Y. L. C. Chadwick, Department of Horticulture, Ohio State University, continues as secretary-treasurer, and Paul E. Tilford of Wooster, Ohio, remains as editor.

Among the papers presented at the conference of particular interest to readers of *Agricultural Chemicals* was one titled "Fertilizer Applications by Foliage Sprays" by Dr. Damon Boynton, Department of Pomology of Cornell University. Dr. Boynton concluded from his studies that the most promising role for nutrient sprays would seem to be in the solution of particular nutritional problems that are not taken care of satisfactorily by ground applications of dry fertilizer. The most important use of nutrient sprays in commercial fruit plantings has been in the correction of minor element deficiencies. There are also special situations in which urea nitrogen sprays have proved useful.

A thorough understanding of the symptoms of deficiencies of the various nutrients in the crops with which one is working, said Dr. Boynton, is important in determining whether or not nutrient sprays may be useful. The particular materials, concentrations and timing of sprays should be based on knowledge of the plant requirements, the effectiveness of sprays in supplying them and the tolerance of the plant to the sprays.

"Control of Some Troublesome Insects" was discussed by Dr. Ernest N. Cory, Department of Entomology, University of Maryland. The imported elm leaf beetle, Dr. Cory warned, has assumed increasing importance in recent years. With the advent of DDT, this insecticide was tried for control, but results have been mostly unsatisfactory. The reported poor results were not due to failure to control the beetle, but rather to an increase in spider mites that produce an unsightly browning of foliage in July and August. Special sprays are needed for the control of the mites and also the increased aphid populations that normally follow DDT use. Dr. Cory concluded that for elm leaf beetle arsenate of lead is still the preferred control material, except in cases of severe Jap beetle infestation.

The building up of mite populations following use of DDT creates multiple problems for the arborist, Dr. Cory observed. The selection of the best spray for mite control is a difficult problem. Sulfur is effective for many mites, but cannot be used near painted houses. Summer oils are likely to damage foliage in hot weather. Such insec-

General photo of Shade Tree Conference group in session at Baltimore. (below)

Dr. Cory tells conference about methods to control a number of insect pests which harm trees and shrubs in various parts of nation. Dr. Steiner discusses nematode threat, reports progress in seeking control through newer insecticides. Trade show is featured.

ticides as TEPP and parathion are effective, but offer toxicity hazards.

The use of highly toxic insecticides, Dr. Cory cautioned, should be restricted to experts. In his definition of experts he included arborists, qualified exterminators, experienced airplane dusting or spraying personnel and large farming operators who employ experienced spray crews.

Dr. Cory mentioned a promising new insecticide introduced recently by Naugatuck Chemical Co. In preliminary tests on linden and elms it has given excellent control of mites, with low toxicity to warm blooded animals.

Turning to a review of local Maryland pest control problems, Mr. Cory commented that mimosa web worms continue to do heavy damage, on honey locust as well as on mimosa. He suggested use of 2 lbs. 50% wettable DDT per gallon, in two spray applications, about June 15 and August 20. Privet hedge, he observed, at one time relatively free from pests, is now frequently attacked by olive scale and a thrips, Dendothrips, *ornatus* (Jak.) DDT emulsions, 25 to 30%, gave complete freedom from live thrips in one day. A second treatment was needed two weeks later.

In the care of azaleas, he observed that the Ledifolia varieties must be sprayed for white fly, and other types for red spider and lace bug. DDT wettable powders did not prove efficient. DDT emulsions proved fair for control of white fly, and excellent for lace bug. Parathion, at 1¼ lbs. of 25% wettable to 100 gallons, was found to give excellent control against all azalea pests. A single application of parathion gave excellent control of red spider for instance, where with wettable sulphur sprays repeated applications were necessary.

Two new scale insects, Dr. Cory warned, threaten to be of major importance. A pit-making oak scale, Asterolecanium *variolosum*, is quite prevalent, while another pit-making scale has been reported from the Baltimore and Washington area, Asterolecanium *putianum*. While no spraying tests have been made so far, Dr. Cory believed that control should be provided by DDT emulsions applied before buds are open, or by 3% lubricating oil emulsions.

"Boxwood Nematode Control" was discussed by Dr. Gotthold Steiner, Division of Nematology, Plant Industry Station, Beltsville Md. A summary of his paper follows:

Nematodes as a cause of decline of boxwood were first discovered in 1939 on samples submitted by L. A. Hetrick from West Point, Va. The disease is mainly attributed to the inroads of various species of meadow nematodes (*Pratylenchus* sp.). Today it is known to occur in the States of Texas, Louisiana, Arkansas, Georgia, South and North Carolina, Tennessee, Virginia, West Virginia, the District of Columbia, Maryland, Delaware, Pennsylvania, New Jersey, New York, Connecticut, Rhode Island and Massachusetts. Besides meadow nematodes, boxwoods are also attacked by some twenty other root parasitic types belonging to 14 additional nematode genera. These eelworms are primarily debilitation factors on the boxwood plant, causing loss of vigor, unhealthy growth, slow decline, dieback and defoliation. Outright killing is seen only in seedlings. Roots are either invaded by these nematodes or are attacked from the surface. Root tips are usually damaged to such a degree that decay sets in. New laterals are then formed which in turn are also invaded and destroyed. Heavily nematized root systems of boxwood therefore often exhibit a bearded, or witches' broom, appearance or extremely dense although stunted growth, mainly of laterals.

Prevention is the most economical control. Nurseries are unfortunately the main distributors of these nematode pests. Nursery stock should be produced and propagated in sterilized or fumigated soil. A preplanting treatment of the permanent planting site with a nematocidal soil fumigant such as mixtures of dichloropropenes-dichloropropane, ethylene dibromide, methyl bromide and others is recommended. Sodium selenate appears to give some temporary beneficial effect. Progressing tests with parathion are more promising, but have not yet reached the stage to permit definite recommendations.

The week of meetings concluded with the annual banquet and floor show the evening of August 25th. Celebrating the 25th anniversary of the conference, the dinner was dedicated to a group of past presidents, and a testimonial scroll was presented to each.

In a trade show which accompanied the meeting, approximately thirty firms displayed equipment, fertilizers, insecticides, weed killers, etc. Among the exhibitors were American Chemical Paint Co., Ambler, Pa.; Dow Chemical Co., Midland, Mich.; A. B. Farquhar Co., York, Pa.; Hardie Mfg. Co., Hudson, Mich.; John Bean Div., Food Machinery & Chem. Corp., Lansing, Mich.; Lawrence Aero-Mist Sprayer Co., Greenfield, Mass.; F. E. Myers & Bros. Co., Ashland, Ohio; B. G. Pratt Co., Hackensack, N. J.; Ra-Pid-Gro Corp., Dansville, N. Y.; and Shell Oil Co., New York.

The Listening Post

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

Stalk Rots on Corn

ARNOLD J. Ullstrup of the Purdue University Agricultural Experiment Station, Lafayette, Indiana, reports that during the first week in July records and samples of *Pythium* stalk rot of corn were sent in from nearly every section of Indiana. Most reports were from the southern half of the State, but in a few cases the disease was observed within 50 miles south of Chicago. Onset of the disease was preceded by two weeks of hot humid weather with maximum temperatures in excess of 90° F.

Although the disease has occurred before in Indiana, it has been only in insignificant proportions, previously. This year, however, appreciable damage is expected. In one 100-acre field about 60 miles north of Lafayette, 10 percent of the stalks were already broken over and about the same percentage showed incipient infection. In one reported case, 20 to 30 percent of the plants were severely rotted. The disease did not appear to be associated with any particular soil type in Indiana, nor, at the time of the report, was there any evidence of differences in susceptibility among hybrids.

At about the same time the same disease was reported from Daviess, Henderson, and Union Counties, Kentucky, according to W. D. Valleau and Stephen Diachun of the Kentucky Agricultural Experiment Station. Inspection in these counties indicated occurrence only in fields near the Ohio River, subject to overflow. Here also, night and day temperatures were exceptionally high before and during the period of decay, and humidity was high. Growers claimed that they had never seen the disease in river-bottom corn before.

Rotting was usually confined to the stalk between the first and second joints just above the ground, but infection sometimes extended a foot above ground. All except the vascular bundles or fibrous part of the stem eventually rotted away. New roots were being put out from the root system, and also from the joint above the decayed area if it was in contact with the soil. The plant usually remained turgid for several days after the internode was completely rotted.

Loss was very small on the average, but in small areas, as high as 50 percent of the plants were rotted and fallen over.

In both these States the disease was caused by the fungus *Pythium butleri*, which probably was offered ideal conditions for infection by the exceptionally high temperatures and high humidity.

In Illinois, another stalk rot, the bacterial stalk rot caused by the soft rot bacterium *Erwinia carotovora*, has suddenly become much more wide-spread and abundant than in past years, according to G. H. Boewe of the Illinois Natural History Survey. This stalk rot has been observed in the State from time to time since 1922. It has always occurred in the extreme southern part of the state and always in only a few fields. This year, however, it has appeared in many more fields and as far north as Champaign County. In a survey of southern Illinois corn fields, July 19 to 22, the disease was found in most bottomland and lowland fields examined. In most fields less than 1 percent of the stalks were affected, and in no field in which exact counts were made were more than 4 percent of the stalks affected. However, the disease has been abundant enough to attract general attention. One grower reported 10 percent of his stalks affected.

Bacterial stalk rot appears as a conspicuous localized rotting and collapsing of the stalk near the ground. When rotting has progressed sufficiently, the affected stalk topples over, twisting as it falls. This twisting, usually very apparent in the rotted part, is one of the best means of recognizing this disease. Rotting usually affects the stalk between either the first and second or the second and third joints. The affected part becomes a soft, brown to blackish, water-soaked, decaying, and disintegrating mass, in which only the vascular strands remain intact to hold the bottom and top parts of the stalk together. When humidity and temperatures are both high, decay progressess rapidly through the entire thickness of the stalk, and the tissues collapse and finally dry into a light brown mass mixed in with the easily separable vascular strands.

No control measures are known for bacterial stalk rot, but the disease has so far not been sufficiently abundant in most places to require control. However, this sudden appearance in greater than usual amounts over a much larger part of Illinois suggests the advisability of watching it carefully.

Magnesium Deficiency Noted

CHARLES Chupp and H. John Carew of Cornell University report severe spotting of musk-melon foliages in many fields of the musk-melon sections of up-State

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New York this year. The more seriously affected leaves died, dried up and shriveled. The youngest spots began as minute dots barely visible to the unaided eye, with narrow translucent borders. As a particular spot enlarged, it became pale brown to tan. In some instances the spots resembled those caused by one or another fungus disease of muskmelons. The lesions only rarely followed between the veins and did not seem to be confined to any particular part of the leaf.

When no organism could be found associated with the spots, a field survey was made July 11 and 12. The survey indicated that, especially in Washington, Saratoga, Albany, Schenectady, and Tompkins Counties, the trouble was present wherever lime with a high magnesium content had not been applied. In at least one field, such lime was applied over one half the field but not over the other half. Plants were healthy in the limed part and severely affected in the remainder of the field. On other farms, fields treated with dolomitic lime were free from injury, whereas untreated fields showed the spotting.

The survey indicated magnesium deficiency as the cause, even though the symptoms were not typical. Apparently the hot dry weather that prevailed since May influenced the development of the unusual type of the injury where magnesium was lacking. The yellowing between the veins, especially of the older leaves, and other symptoms normally associated with magnesium deficiency seemed to be absent altogether.

Wildfire Epidemic in Tenn.

WIDESPREAD occurrence of wildfire, caused by the bacterium *Pseudomonas tabaci*, in tobacco plant beds of east Tennessee this spring is reported by Howard E. Heggestad of the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering and the Tennessee Agricultural Experiment Station. The disease was first apparent about the middle of April, after which, frequent rains favored disease development. Plants in small areas were killed as the bacterial toxin spread to the growing point.

Later spread of wildfire was attributed to weeding while leaves were wet and to the activity of tobacco flea beetles. Also, in a high percentage of the plant beds, the cotton covers lay directly on the plants with edges fastened to the ground by wires through the grommets, instead of being fastened to board frames or poles raised above the plants. Early infection was difficult to detect in these beds. Flea beetle injury was more prevalent and, no doubt, considerable plant injury and spread of wildfire took place when the wet cotton cover was moved for any reason, such as weed pulling.

On three different farms wildfire

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The Insect Situation During the Late Summer

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

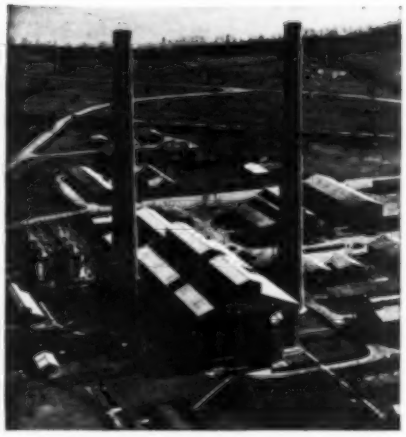
HEAVY and destructive populations of the Mexican bean beetle continued to persist throughout August in many parts of the Atlantic Coast and Gulf regions from Maine to Mississippi, and also in parts of Tennessee and Ohio. Unusually severe infestations of the two-spotted spider mite occurred on beans during part of the month in New Jersey, Delaware, Virginia, Idaho, central Washington, and southern California. The corn earworm was abundant in destructive numbers on beans in Long Island, New York, and in parts of New Jersey, Maryland, and Virginia. It occurred in smaller numbers on that crop in central Washington. Other insects reported attacking beans during the month included the potato leafhopper in parts of Virginia and Ohio, the lesser cornstalk borer in Maryland and Virginia, the bean leaf beetle in Virginia and northwestern Tennessee, white flies in Virginia, Ohio, and California, thrips in Idaho and California, the bean aphid in Delaware and California, the green clover worm in Delaware and Virginia, and the lima bean pod borer, the salt marsh caterpillar, and Lygus bugs in California.

Infestations of cabbage caterpillars continued generally moderate to heavy during the first half of August along the Atlantic seaboard and in Wisconsin, Utah, Wyoming, and the lower Rio Grande Valley of Texas. Lighter populations were reported from California. During the last half of the month they continued moderate to heavy on limited plantings or remnants of cole crops in several areas, including parts of New York, Virginia, Georgia, Florida, Alabama, Tennessee, Ohio, Idaho, and California. Aphid populations were destructively abundant on cabbage early in the month in New York, New Jersey, and Idaho, with lighter populations reported from Wisconsin, Utah, and California. Grasshopper infestations constituted a serious threat to cole crops in New York and Ohio early in August, and armyworms were infesting these crops in New Jersey and South Carolina around the middle of the month. The harlequin bug occurred in moderate numbers on crucifers in the South and in Tennessee during most of the month. Flea beetles injured

SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*MINING



The process of mining sulphur, as developed by Herman Frasch, takes advantage of the fairly low melting point of sulphur (about 240° Fahrenheit). The process resolves itself into three parts: one, operating a power plant that heats and pumps to the field large quantities of water; two, distributing the hot water through wells to melt the underground sulphur, and raising the melted sulphur to the surface; three, cooling and solidifying the sulphur in large vats from which it is broken and loaded into cars for shipment.

The power plant and water reservoir, as well as the vats and permanent structures, are placed at some distance from the sulphur deposit to avoid possibility of damage from surface subsidence, resulting from extraction of the underground sulphur.

Loading operations at one of the huge vats of Sulphur at our Newgulf, Texas mine. Such mountains of Sulphur are constantly being built at our mines, from which shipments are continually made.

TEXAS GULF SULPHUR CO. INC.

75 East 45th St. New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

seedling cabbage in New Jersey early in August and were attacking mustard and turnips in Louisiana toward the end of the month. The cabbage looper caused severe injury to cole crops in plant beds in the lower Rio Grande Valley of Texas in late August.

Hornworms were unusually abundant and caused serious damage to tomato during the early part of the month in Maine, New York, New Jersey, Delaware, Maryland, Virginia, and South Carolina. They were reported in smaller numbers in Wisconsin around the middle of the month. Heavy infestations were also reported from Florida and Tennessee toward the end of the month and the worms were persisting in abundant numbers in New York and New Jersey. Hornworms were injuring pepper in California early in the month.

Infestations of the tomato fruitworm were on the increase in Utah early in August and moderate to heavy populations occurred on tomato there and in western Colorado. This insect caused considerable damage in New Jersey around the middle of the month and was also reported from Alabama. Toward the end of the month it was causing injury by tunnelling potato vines in South Carolina, was still abundant in Utah and Colorado, and was reported from Mississippi.

Psyllids Continue

POTATO psyllid, mentioned in this column during the previous two months as occurring in outbreak proportions on potato and tomato in Nebraska, Colorado, and Wyoming, continued its depredations in that area well into August. Flea beetles were numerous on potato in Wisconsin early in the month but were reported in lesser numbers on that crop in Maine, New York, and Colorado. They were present in light but increasing numbers on potato and tomato in Nebraska, Colorado, and Wyoming, around the middle of the month, and were also injuring eggplant in Texas. The potato aphid occurred in outbreak numbers on potato in Massachusetts early in August. Aphid populations on potato increased in abundance during the first half of the month in Maine and Wisconsin. Toward the end of the month they were destructively abundant in New York, but were on the decrease in central Washington.

The heavy aphid infestations on tobacco in northwestern Tennessee that were reported in July, persisted well into August. Growers, however, through the persistent application of insecticides, were said to be getting good control, and the infestation was decreasing rapidly toward the end of the month. Aphids were causing trouble in some tobacco fields in the Connecticut Valley of Massachusetts early in August, and a widely distributed but light infestation of these pests was reported on tobacco in Dane County, Wisconsin toward the end of the month. An outbreak of flea beetles on tobacco in northwestern Tennessee was being brought under control early in August, but these pests continued troublesome there throughout the month. Hornworms continued numerous on remaining tobacco in Georgia, Florida, and Tennessee, but were present in only moderate numbers on that crop in Wisconsin.

Cotton Pests Endure

BY August, the boll weevil had become much more generally abundant than for many years in the 12 States where it occurs. Greatest damage to cotton appeared to be occurring in Mississippi, although very serious damage was also reported from Alabama, Georgia, South Carolina, Arkansas, and Louisiana. The weevil situation was also serious in parts of Oklahoma and Texas and more weevil damage was reported from Tennessee and North Carolina than during any recent year. Infestations were still increasing rapidly in southeastern Virginia at the end of the month. Entomologists continued to urge farmers to use insecticides where necessary to protect bolls from weevil attack in the northern areas and thus save thousands of bales of cotton which would be lost otherwise.

Considerable damage to cotton from bollworms was reported during August from parts of Texas, Oklahoma, Arkansas, and North Carolina. Some damage from this insect was also reported from Louisiana, Alabama, Mississippi, and Florida. Scattered light infestations of the cotton leafworm were observed during August in Calhoun, Matagorda, Victoria, Refugio, and Jackson Counties, Texas, and in Geneva County, Alabama. These, however, occurred too late in the season to cause damage.

Little change in the fruit insect situation was indicated by reports received during August. Weather conditions were favorable for activity of this insect during the early part of the month in the Hudson Valley area of New York, in New Jersey, and Ohio. Larval entrances were still being observed in southern Indiana and southern Illinois, some Kansas orchards were reported to be showing injury, and the summer brood was still active in the Yakima Valley of Washington. Some increase in red-banded leaf roller infestations occurred early in the month in southern Indiana and southern Illinois. At that time European red mite infestations still appeared to be increasing in peach and apple orchards of New Jersey. These mites were on the decline in many Ohio orchards, but were present in considerable numbers in some orchards of Coles and Rock Island Counties, Illinois. Orchard mites, particularly the two-spotted spider mite, were still causing trouble, especially on peaches, in the Yakima Valley of Washington shortly after the first of August.

Wide 'Hopper Area

THE survey of adult grasshoppers conducted by the Bureau of Entomology and Plant Quarantine and cooperating agencies was practically completed by the end of

(*Turn to page 70*)

VIRTUALLY UNBREAKABLE!

So strong that the pH-sensitive bulb can withstand as much pressure as the thick stem itself!

Abrasion resistant — unusually rugged for long life and reliable measurement even in highly abrasive slurries!

Chemical durability — excellent in the strongest acids and alkalis . . . even at elevated temperatures!

COVER EXTREME TEMPERATURES!

30° to 130° C at high pH — with the new high temperature—high pH glass.

—20° to 100° C — with the new general-purpose glass. Will withstand even repeated freezing.

Now- NEW BECKMAN pH Electrodes

UNPRECEDENTED pH RANGE!

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0 to 11 pH — at room temperature and 0 to 10 pH at boiling for the general-purpose glass . . . *without correction for sodium ions!*

IMPROVED CONSTRUCTION!

Simplified, heat-resistant construction eliminates wax filling . . . retains patented Beckman internal shielding . . . increases measurement precision.

Only *Beckman Glass Electrodes* offer all of these features:

- **RAPID RESPONSE** . . . accuracy with speed and convenience.
- **STABILITY** . . . to match the high precision of BECKMAN pH METERS.
- **INTERNAL SHIELDING** . . . gives complete freedom from outside electrostatic interference.
- **INTEGRAL LEADS** . . . Continuous insulation into the electrode . . . connections located on protected panel board.
- **EXTREME TEMPERATURE RANGE** . . . Several types permit use from below freezing to boiling *and above!*
- **ENTIRE pH SCALE** . . . *Very small* sodium ion errors . . . e.g., with high-temperature high-pH glass, only 0.2 pH deviation at 13.7 pH in 1 N sodium hydroxide.
- **FACTORY SEALED** . . . rigidly tested . . . no maintenance.
- **UNIQUE CHEMICAL DURABILITY** . . . in alkali . . . in acid . . . in dilute solutions.

And . . . *REALLY TOUGH* . . . can even be used as a stirring rod!

These new electrode glasses are now being used in several Beckman electrode styles. As rapidly as possible, they will be available in the full line of Beckman Glass Electrodes.

Constant Research over the years has maintained Beckman Leadership in the instrumentation field . . .
—Beckman *pH Meters and Glass Electrodes*
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DDT

100% Technical grade
50% Wettable dust
25% Emulsifiable solutions
30% Emulsifiable solutions
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2,4-D

Acid
Sodium salt
Triethanolamine salt
Methyl ester
Butyl ester
Isopropyl ester
40% Butyl ester solution
44% Isopropyl ester solution

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80 LISTER AVENUE • NEWARK 5, N. J.
Manufacturers of Organic Chemicals

Suppliers' Bulletins

Grinding Equipment Bulletin

Sprout-Waldron & Co., Inc., Muncy, Pa., has issued a new bulletin giving complete descriptions of its line of equipment, including machines for size-reduction operations, mixing and blending, bulk materials handling, product classifying, and pelleting and special facilities machines. Write for Bulletin 44, care of the company.

•

Grasshopper Story Told

Hercules Powder Co., in its publication *Toxaphene News Digest* for August, reproduced a picture story of the fight against grasshoppers in the West during the summer months. Photos show hordes of grasshoppers on the ground, a large storage area where bags of bait were kept prior to use in the field, and a shot of an airplane being loaded with toxaphene.

The August issue also includes a story on mechanical cotton picking, in connection with the harvesting of the largest crop in a dozen years. Part of the high yield is credited to the application of insecticides for control of cotton insect pests. Copies of *Toxaphene News Digest* are available from the company, Wilmington, Del.

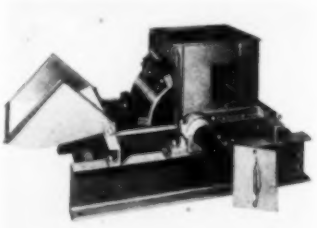
•

"Dowfume" Bulletin Offered

Dow Chemical Company's Great Western Division has issued a bulletin on "Dowfume W-85," a soil fumigant formulation for the control of wireworms and nematodes. The pamphlet contains information on the pests controlled by the product, application suggestions and directions for dilution as well as dosage recommendations. Included also are precautions to be observed in using the material. Copies are available from the company's San Francisco office, 310 Sansome St.

Sturtevant Offers New Mill

A new rotary pulverizer for grinding tailings has been announced by the Sturtevant Mill Co., Dorchester, Mass. According to the makers, the new unit may



be used when basing, shipping super phosphate or complete goods. A number of improvements feature the pulverizer, the company states. Rigid rotating bars smash lumpy tailings against an adjustable breaker plate, then rub any oversize pieces against the breaker plate to assure complete grinding of all pellets. Clogging is eliminated, and there is no daily accumulation of unground raw pellets, it is claimed. The unit operates at speeds of 550 to 600 rpm using a 15 hp motor. A bulletin is available from the company upon request.

•

"Payloader" Literature

Frank G. Hough Co. has issued a new pamphlet on material handling by the company's "Payloader" system. The bulletin is designated as "Job Study No. 13," and is available from the company, 743 Sunnyside Ave., Libertyville, Ill.

•

Myers Describes Sprayers

F. E. Myers & Bro. Co., Ashland, Ohio, have announced the production of two types of hand sprayers for applying 2,4-D and similar herbicides. Literature describing the firm's "Kwickfill" compressed air sprayers is available from the company.

Synthetic Organics Guide

Carbide & Carbon Chemicals Corp., New York, has issued the 1950 edition of its booklet, "Physical Properties of Synthetic Organic Chemicals." Designed as a condensed guide for the user of such chemicals, it contains data on applications and physical properties for more than 200 synthetic organics. Copies are available from the company, 30 E. 42nd St., New York 17. (Ask for form 6136.)

•

Tells About Dust Collectors

An Industry report on the use of "Dustube Dust Collectors" in the manufacture of fertilizer, has been announced by American Wheelabrator and Equipment Corp., 555 S. Byrkit St., Mishawaka, Indiana. Photographs and drawings are used to show the operation of the equipment in reducing dust in mixing, handling and bagging.

•

How to Install Cyanogas

American Cyanamid Co. has published instructions for the installation of cyanogas applicators in grain elevator conveyor belts, in its publication, *Grain Fumigation News*. The bulletin, prepared on punched stock for convenience in keeping in a three-ring binder, is available from the Company's Agricultural Chemical Division, Insecticide Department, 30 Rockefeller Plaza, New York 20, N. Y.

•

Shell Booklet on "D-D"

Shell Chemical Corp. has published an illustrated booklet on control of nematodes with the company's product, "D-D." The folder contains information on proper time for treating, rate and frequency of "D-D" application, and presents a number of photographs of equipment used for injection in the soil. Copies of the booklet are available from Shell Chemical Corp., 500 Fifth Ave., New York 18, N. Y.; or 100 Bush Street, San Francisco 6, Calif.

Technical Briefs

Hormones Boost Fig Growth

Following a spray application of 2,4-D or 2,4,5-T at concentrations of 250 ppm or more, mature, edible, seedless fruit could be induced from non-caprified Calimyrna figs, it has been reported. The treatment hastened maturity of non-caprified fruit when applied after the fruit reached nearly maximum size. Applications before this time were ineffective and caused injury. They were injurious also to leaves and stems. Sprays of 250 ppm acid equivalent of the butyl ester of 2,4,5-T appeared to be more injurious to leaves and stems than sprays containing a similar concentration of the isopropyl ester of 2,4-D. Lanolin pastes containing various growth regulators did not induce fruit growth when applied on the fruit.—W. S. Stewart and Ira J. Condit, *American Journal of Botany*, 36, 332–5 (1949).

•

DDT Tested in Storage

Preliminary experiments with DDT indicate that the toxicity of the insecticide was reduced by exposure to sunlight for 32 and 64 hours, or during storage. The tests were made on houseflies. Deposits from aqueous suspensions were more toxic than those from emulsions, and maintained higher mortality after exposure to sunlight. The best emulsion contained carbon black, but carbon black did not protect DDT from sunlight decomposition.—R. D. Chisholm, R. H. Nelson and Elmer E. Fleck, *Journal Economic Entomology*, 42, 154–5 (1949).

•

Fertilizer on Potatoes

University of California Agricultural Extension Service and Truck Crops Division have investigated potato fertilizer needs in three trials in San Joaquin County. Data from two tests conducted on McDonald Island indicated that a fertilizer containing about 80 pounds each of nitrogen and phosphoric acid and 160 pounds of potash produces best results.

The third test, at Terminous, indicated need for a fertilizer containing about 160 pounds each of nitrogen, phosphoric acid and potash.

•

Molybdenum Helps Lettuce

Lettuce plants which were yellowing, stunting, and having a high amount of oxidizing material in the intervenal tissues were treated with solutions of molybdenum salts. This treatment resulted in better growth, a darker green color, and a reduction in the amount of oxidizing material in the tissue. Solutions of .07 to .09 grams per plant of Na_2MoO_4 and .0095 to .025 grams per plant of $(NH_4)_2MoO_4$ were applied, and both compounds were about equally effective. No symptoms of toxicity were evident as a result of the use of the salts. *J. Australian Inst. Agr. Sci.* 14, 180–7 (1948).

•

Station Tests 2,4-D

Checking on reports that 2,4-D is not dependable for poison ivy control, tests were run at the New Hampshire Agricultural Experiment Station, Durham, to compare this herbicide with some better known poison ivy killers. Results, briefly, were as follows:

Borax at 4 lbs. per 100 sq. ft. and "Ammate" at ¾ lb. per gallon of water, per 100 sq. ft., gave complete kills. The methyl ester of 2,4-D, at 1,000 parts per million of water was entirely effective only after a second application. The ammonium salt of 2,4-D at 1,000 ppm. of water was considerably less satisfactory than the methyl ester. In another test, the butyl ester ("Weed-No-More") of 2,4-D in one application destroyed nearly all poison ivy on the area treated.

Continuing, the report says: "In view of the fact that most initial treatments of poison ivy with "Ammate" and borax require follow-up applications of herbicide, it may well prove as effective, in the long run, to use the 2,4-D esters as to use "Ammate" or borax."

•

Helicopter Use Studied

Maine Agricultural Experiment Station, Orono, Me., submits some definite, new figures showing the advantage of the helicopter for spraying and dusting potatoes. Where conventional ground spraying equipment was used, a study made at the station revealed, the reduction in yield in the rows injured by the sprayer wheels varied from 17.1 to 27.9 barrels per acre, the average being 21.8 barrels, while, considering the whole field, the reduction in yield averaged 19.9 barrels.

Average loss per acre with a 6-row boom was 14.6 barrels; with an 8-row boom, 11 barrels; and with a 10-row boom, 8.7 barrels. Corresponding percentage crop loss for these different length booms was 8.6, 6.4 and 5.1 percent respectively. With potatoes selling at $4 per barrel, the respective money losses for the 6.8 and 10-row booms would be $58.40, $44 and $34.80, it was computed.

Use of the helicopter, on the other hand, it was pointed out in the report, eliminates all this loss from wheel injury by the spraying and dusting equipment. The helicopter is also very maneuverable and good coverage of foliage is obtained, even at ends and sides of fields and in places obstructed by trees or other objects. One objection cited, however, is the relatively high cost of the use of a helicopter.

Nine commercial defoliants tested at the Maine station for killing potato tops gave satisfactory kills, if applied so that 100 percent coverage was obtained and if applied, also, under conditions favor-

(*Turn to page* 70)

Right—for Rights-of-Way

and other brush control uses

Pittsburgh 10-20 BRUSH KILLER

Contains 2,4,5-T and 2,4-D Esters

10-20 Brush Killer effective on these plants:

Blackberry
Elderberry
Sumac
Osage Orange
Willow Alder
Buck Brush
Wild Cherry
Hawthorn
Black Locust
Poison Ivy
Cherokee Rose
Sage Brush
and many other woody plants

Nothing is more savory than a juicy blackberry pie or the strong, sweet flavor of elderberry jelly—but the woody growth of these and other plants such as sumac, alder and osage orange can make a "jungle" out of public utility rights-of-way, grazing lands, farms and creek banks unless constantly controlled.

Pittsburgh 10-20 Brush Killer, a hormone type herbicide, containing 2,4,5-T and 2,4-D Esters, has proved much more effective than 2,4-D alone for control of such heavy underbrush and gives a permanent kill with one application when properly used. It may also be painted on fresh-cut stumps of poplar, willow and other persistent trees to prevent re-growth. Combined with *Pittsburgh* Phenolate-O, 10-20 Brush Killer may also be used as a general weed killer.

Pittsburgh 10-20 Brush Killer is the answer to your brush-control problems. Full technical information about this effective chemical, and advice concerning its use, is available for the asking!

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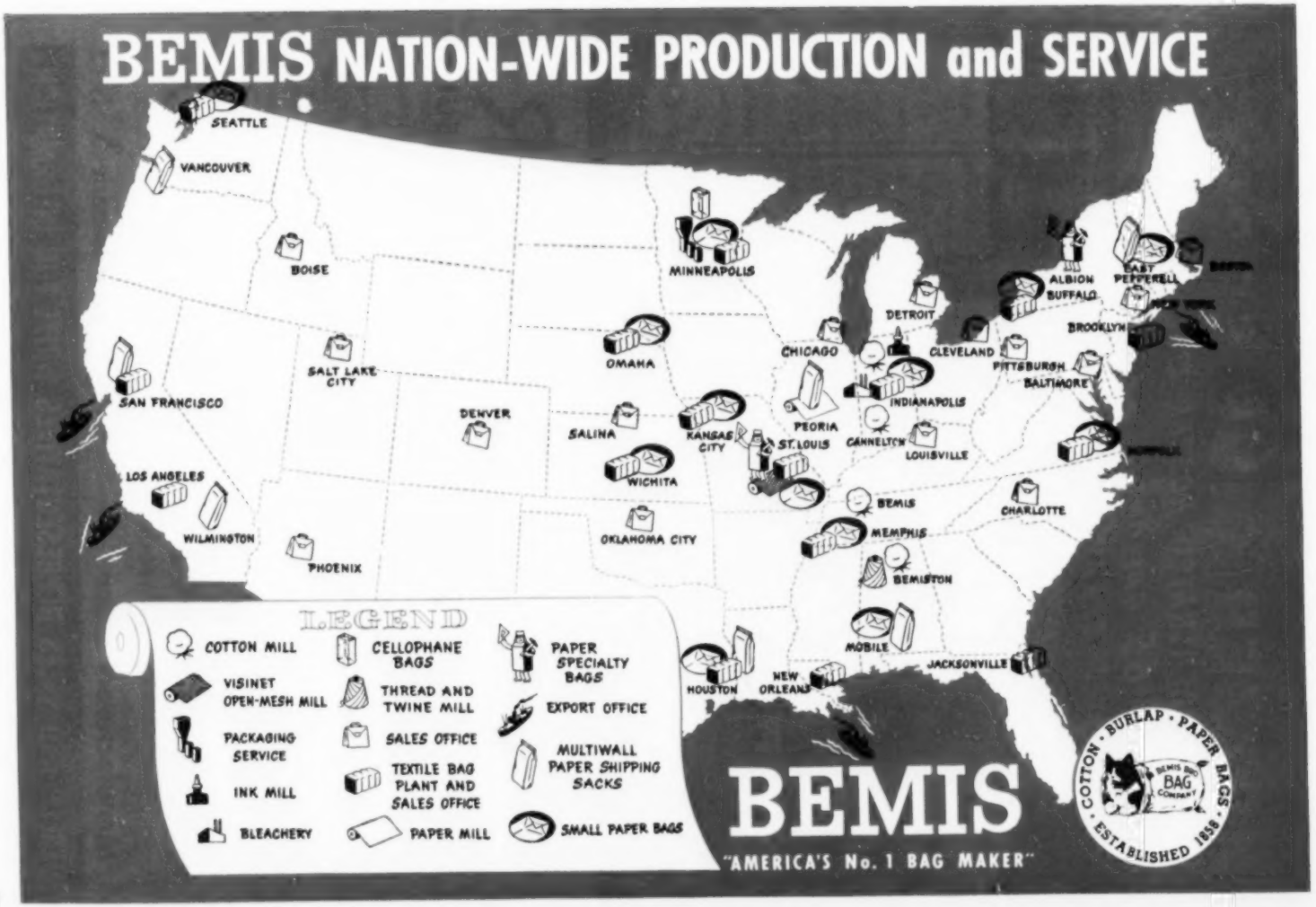
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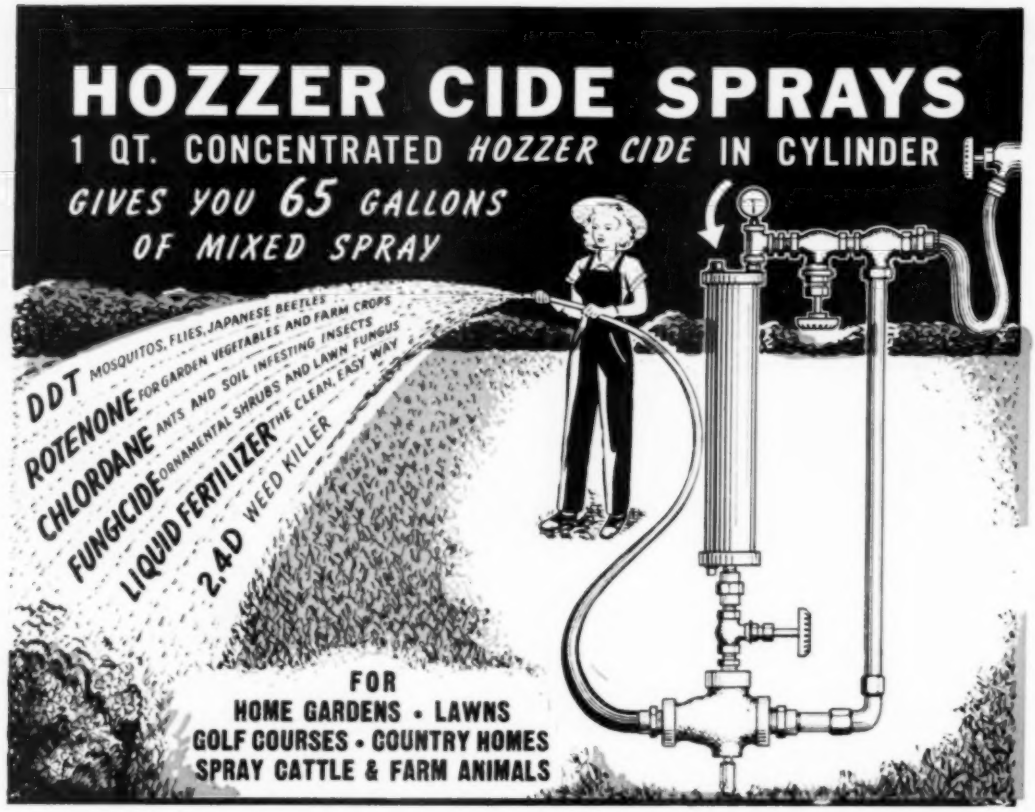
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1 QT. CONCENTRATED HOZZER CIDE IN CYLINDER
GIVES YOU 65 GALLONS OF MIXED SPRAY
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LIQUID FERTILIZER THE CLEAN, EASY WAY
2,4-D WEED KILLER
FOR
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SPRAY CATTLE & FARM ANIMALS

BUGHOZZER

OPERATES ON REGULAR HOUSE WATER PRESSURE

An applicator for insecticides, fungicides, weed killers and liquid fertilizers. Operates from water pressure from ordinary hose connection.

Offers easiest way in the world to apply crabgrass killer.

Operating time is from 14 to 36 minutes, depending upon the amount of pressure used.

One quart of concentrate "HOZZER CIDE" sufficient to spray up to a half acre.

Complete instructions given on labels of spray material holders.

Apparatus weighs only eleven pounds, and may be installed in approximately two minutes. Simply drive stake into ground near water outlet, place the BUGHOZZER on stake, connect its hose to spigot and fasten garden hose to bottom. When cylinder is filled with toxicant, the concentrate is mixed properly with flowing water.

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DEALER AND SALES REPRESENTATIVES WRITE FOR INFORMATION

INDUSTRY NEWS

A.A.E.E. and E.S.A. May Unite

The possibility that the American Association of Economic Entomologists may consolidate with the Entomological Society of America perhaps by the end of 1950, was seen in an announcement to A.A.E.E. members by Dr. A. M. Boyce, University of California, president of the Association.

A study of the proposal is now in progress by a committee from each organization, Dr. Boyce reports, and a full report will be made to the executive committee of the A.A.E.E. just before the annual convention at Tampa, Fla., December 13–16. Members of the A.A.E.E. committee are, Dr. B. A. Porter, chairman; Dr. H. M. Harris and Dr. J. L. Horsfall.

•

Texas Group Plans Meeting

The Texas Entomological Society will hold its annual meeting at the Rice Hotel, Houston, Texas for two days; January 19 and 20, 1950. According to L. F. Curl, secretary-Treasurer of the group, the program has not yet been completed, but will be announced later. Other officers of the Society are: Cameron Siddall, manager of the Southwestern Division of Pennsylvania Salt Mfg. Co., Bryan, Texas, president; H. G. Johnston, head of the Department of Entomology, Texas A. & M., vice-president.

•

Ithaca Meeting Next Month

Program plans were nearing completion at press time for the annual New York Insecticide & Fungicide Conference to be held at Ithaca, N. Y., on November 14, 15 and 16. Drs. Charles E. Palm and L. M. Massey, Cornell University, are in charge of the meeting plans. Papers to be presented at the conference are of informal nature and "off the record" for the larger part, Dr. Massey says.

Brunton Joins Kolker

J. G. Brunton has been named vice-president in charge of sales by the Kolker Chemical Works, Newark, N. J. He was formerly sales manager of the Agricultural Chemicals Division of Pennsylvania Salt Mfg. Co., Philadelphia.

Mr. Brunton is a native of San Diego, Calif., and a graduate of the University of California. He did graduate work at the University, following which he was associated with the Agricultural Commissioner's office in San Diego. Joining Penn Salt as a District Sales Representative on the West Coast, he was later transferred to Philadelphia where he became sales manager of agricultural chemicals.

J. G. Brunton

During the war years, he served as industry representative on the War Production Board's DDT Insecticide Advisory Committee and Arsenical Insecticide Advisory Committee. He was also a member of the War Food Administration's Insecticide Industry Committee.

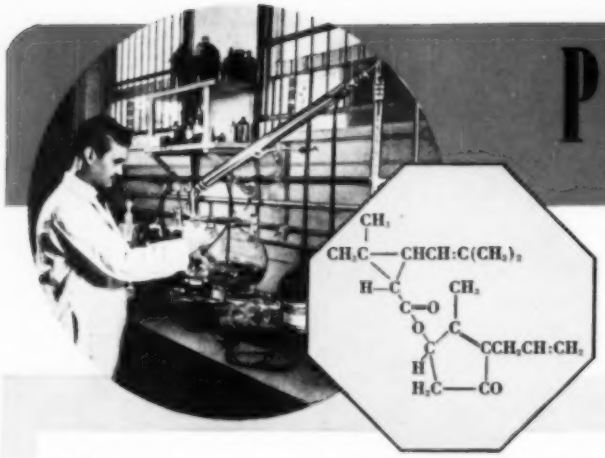
•

Richmond New BEPQ Leader

Roy G. Richmond, U.S.D.A. biologist, has been appointed leader of the Bureau of Entomology and Plant Quarantine division of Domestic Plant Quarantines, it has been announced by Dr. P. N. Annand, chief of the Bureau. Mr. Richmond will replace the late B. M. Gaddis, former leader. He has been with the Bureau since 1938, and makes his home in Arlington, Va. A veteran of World War I, he was decorated by King George V for bravery in action with the Canadian Field Artillery.

MEETINGS

National Pest Control Association, Biltmore Hotel, Los Angeles, Calif., October 17–19.
Agricultural Spraying & Dusting Conference, Wenatchee, Washington, Oct. 20 & 21.
American Society of Agronomy, Milwaukee, Wisconsin, October 24–28, 1949.
California Fertilizer Association, 26th Annual Convention, Palace Hotel, San Francisco, Calif. November 7, 8, 9, 1949.
National Fertilizer Association, Annual Fall Meeting, Atlanta Biltmore Hotel, Atlanta, Ga., Nov. 14–16.
New York State Insecticide & Fungicide Conference, Ithaca, N. Y., Nov. 14–16.
Western Canadian Weed Conference, Edmonton, Alberta, Nov. 15–17.
California Entomology Club, Berkeley, Calif., Nov. 18.
Nat'l. Association of Insecticide & Disinfectant Mfgrs., Mayflower Hotel, Washington, D. C., Dec. 4–6.
North Central Weed Control Conference, Sioux Falls, S. D., Dec. 6, 7, 8, 1949.
American Association of Economic Entomologists, 61st Annual Meeting, Tampa, Florida, December 13, 14, 15, 16, 1949.
American Phytopathological Society, Martinique Hotel, New York, December 28, 29 & 30. (In conjunction with American Association for Advancement of Science)
Northeastern States Weed Control Conference, Hotel New Yorker, New York, January 3–5, 1950.
Texas Entomological Society, Rice Hotel, Houston, Texas, January 19 & 20.
Western Weed Control Conference, Denver, Colorado, Januaiy 31 to February 2.
Association of Southern Agricultural Workers and Southern Weed Control Conference, Biloxi, Miss., Feb. 8–10.



PYRESYN

(Synthetic pyrethrum)

—more precisely: allyl homolog of Cinerin I

Credit is due the fifteen years' work of LaForge and Schechter (USDA) for the synthesis of the compound chemically diagrammed above and publicized by the Government in March. Industry research teams promptly undertook duplication of the process and our staff was able to announce in June the completion of laboratory manufacture of the compound to which we have assigned our trademarked name PYRESYN.

Entomological studies indicate it is comparable to natural pyrethrum on flies and mosquitoes. Evidence indicates that PYRESYN can be synergized with n-Propyl Isome (another Penick product) to enhance the control of other insects. Other systematic tests on a variety of insects are under way and reports will be published. Comparative data on knockdown, kill and residual effects are also being assembled. Simultaneously, pharmacological tests are in progress to establish the already fairly well-founded belief that the compound is no more toxic to warm-blooded animal life than pyrethrum whose low order of toxicity is universally recognized.

Paralleling the necessary tests mentioned above, PYRESYN is now in the process of commercial production and deliveries are scheduled for January 1st for the 1950 season. Quotations will initially be made in quantities from one pound to ton lots. Supplemental production is planned to meet demand.

This outstanding research and production accomplishment should tend to relieve the supply situation of the natural pyrethrum flowers—and at a competitive price level.

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N.E. Weed Conf. Plans

Papers for presentation at the Northeastern Weed Control Conference to be held at the Hotel New Yorker, New York, January 3, 4 and 5, should be in the hands of committee members by the middle of October, according to Thomas E. Cox, American Cyanamid Co., New York, program chairman.

Papers related to field crops and turf should go to Dr. S. M. Raleigh, Dept. of Agronomy, Pennsylvania State College, State College, Pa.; horticultural crops, to Prof. W. H. Lachman, Dept. of Horticulture, University of Massachusetts, Amherst, Mass.; Woody plants and special problems, to Dr. Alfred M. S. Pridham, Dept. of Horticulture, Cornell Univ., Ithaca, N. Y.; public health, to A. H. Fletcher, New Jersey State Dept. of Health, Trenton, N. J.; and general subjects to Thomas R. Cox, Agricultural Chemicals Division, American Cyanamid Co., 30 Rockefeller Plaza, New York 20.

•

Washington Meetings on

Meetings of four agricultural groups were scheduled to be held at the Shoreham Hotel, Washington, D. C., from October 5 to October 12, inclusive. These were the National Association of Feed Control Officials, scheduled to meet on October 5 and 6; the Association of American Fertilizer Control Officials, meeting on October 7; the Association of Economic Poisons Control Officials, October 8; and the Association of Official Agricultural Chemists, Inc. on October 10, 11 and 12. Sunday, October 9, was to be an open date.

Officers were to be elected by each group, and a full program of talks, symposia, and business sessions were on the agenda for the entire week. The American Plant Food Council had planned a banquet for members of the Fertilizer Control Officials group; and the National Fertilizer Association was to hold a similar event in honor of the Association of Official Agricultural Chemists.

A full report of the meetings will be presented in the November issue of *Agricultural Chemicals*.

•

Washington State Conference

An agricultural dusting and spraying conference was scheduled to be held at Wenatchee, Washington, October 20 and 21, according to H. S. Telford, Associate Entomologist, State College of Washington, Pullman. The meeting, heralded as the first annual event of this kind, was to be under the sponsorship of the Washington State Aeronautics Commission, the Washington State Department of Agriculture and the Institute of Agricultural Sciences of the State College of Washington.

Speakers from the Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture; from the Washington State

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College and representatives of industry were listed on the advance program. Problems relating to the aerial application of agricultural chemicals were to be discussed, Dr. Telford said.

It was indicated that if the preliminary conference should prove to be of sufficient interest to the group, it may be expanded into a regular school at Washington State College in subsequent years.

•

Hercules Appoints Two

Two appointments in Hercules Powder Company's toxaphene sales force have been announced recently by the company in Wilmington, Del.

Richard J. Both, for the past three years a toxaphene technical service and sales representative in the southeast, has been assigned to special duties in the home office insecticide division under F. U. Rapp.

James H. Neal will succeed Mr. Both and serve as toxaphene technical service and sales representative in the seven southeastern states, including Florida, Georgia, North Carolina, South Carolina, Virginia, Maryland, and Delaware.

•

Pest Control Ass'n to Calif.

The 17th annual convention of the National Pest Control Association was to be held at the Biltmore Hotel, Los Angeles, Calif., on October 17, 18 and 19. Advance program plans called for a division of the delegates into two groups: wood destroying organisms and general pest control, with concurrent sessions for each.

Dr. S. A. Rohwer, assistant chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington, was to present a picture of the over all insecticide situation, and Dr. R. L. Metcalf, University of California, was to talk on "New Insecticides." An open forum was to follow Dr. Metcalf's talk.

Booth exhibits were to be featured at the gathering according to information from William O. Buettner, executive secretary of the Association, Brooklyn, N. Y.

Sheffield Heads Innis, Speiden

W. H. Sheffield, Jr., Vice President of Innis, Speiden & Co., New York, was elected President and General Manager of the company at a recent meeting of the Board of

W. H. Sheffield, Jr.

Directors. His election fills the post left vacant by the death of his father, W. H. Sheffield, President and General Manager since 1926, who died July 25.

The Board of Directors at the same meeting elected R. C. Palmer, Secretary of the company, a member of the Board, and D. S. Cushman, formerly Assistant to the Vice President, has been named Assistant to the President.

•

Kansas Entomologist Dies

R. G. Yapp, Manhattan, Kansas, assistant state entomologist, died September 10 at Atchison, Kansas, while on an inspection trip. He had been in the service of the state of Kansas for 22 years as an entomologist.

•

Park Officials Meet in Mich.

The American Institute of Park Executives, Inc., was to hold its annual convention in Detroit, Mich., September 20-23, with its affiliated groups, the American Association of Zoological Parks and Aquariums and the American Association of Botanical Gardens and Arboretums. Papers were heard dealing with the care of park trees and shrubs, and discussions were held on training in horticulture. Commercial exhibits were set up for the group which met in the Hotel Book-Cadillac. Robert E. Everly, Glencoe, Ill., is president of the A.I.P.E.

•

Cavanagh 40-Year Dow Man

Joseph A. Cavanagh completes forty years with the Dow Chemical Co. this year. Graduating from Michigan State College in agriculture in 1908, he joined Dow immediately as a chemist. For a short period after that he tried sugar chemistry in Cuba and as a chemist in Iowa, but returned to Dow on Dec. 3, 1909, serving continuously since that time. He is one of nine Dow men with 40 years of service. For thirty years, he was engaged in agricultural chemical sales as head of this Dow division. At present, he acts as a consultant for the division, William Allen having succeeded Mr. Cavanagh as manager last year. At one time some years ago, he served four years as mayor of Midland, Mich. At the present time, he is a member of the Michigan House of Representatives from the Midland District, having been elected last fall. His full life story appeared in the August issue of the Dow Diamond, a veritable Horatio Alger tale in true life.

•

So. Ag. Workers to Meet

The Association of Southern Agricultural Workers will hold its annual meeting at Biloxi, Mississippi for three days, beginning February 9, according to advance notices sent to members in September.

•

Heal Joins NPCA Staff

Dr. Ralph E. Heal has been named Technical Director of the National Pest Control Association, effective November 1, according to William O. Buettner, executive secretary of the group. Dr. Heal was formerly senior entomologist and head of the entomological laboratory of Merck & Co., Inc., Rahway, N. J.

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Black Leaf 10 Dust Base—a "free" nicotine compound, easy to mix with non-alkaline carriers to make a neutral dust.

Black Leaf Garden Dust—a multi-purpose dust or spray containing nicotine, pyrethrum and rotenone—*plus* a concentrated fungicide.

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Fertilizer News

Lion Oil Advances Donald

Lion Oil Company, El Dorado, Arkansas, has announced that Leroy Donald, chief agronomist for the company, has been advanced to the position of Administrative Assistant to the vice-president. Mr. Donald has served as chief agronomist since becoming associated with the company in June, 1948.

Leroy Donald

Before his connection with Lion, Mr. Donald had been with the Barrett Division of Allied Chemical and Dye Corp. He is a native of Mississippi, and holds degrees from Mississippi State College.

•

Wisconsin Symposium Held

THE Centennial Symposia on Mineral Nutrition of Plants was held at the University of Wisconsin, Madison, on September 1–3, as scheduled. Featured on the program were representatives of the U. S. Department of Agriculture, the fertilizer industry, large growers of foodstuffs, experts from American and foreign universities, and the U. S. Army Chemical Corps.

Chairman of the first section was Prof. Noble Clark, associate director of the Agricultural Experiment Station of the University of Wisconsin, who introduced Dr. I. L. Baldwin, vice-president of the University. World food possibilities and the fertility status of soils in the U. S. were discussed in a paper by C. E. Kellogg and A. C. Orvedal, U.S.D.A., Beltsville, Md.

The afternoon session of the first day took up the factors affecting nutrient availability in soils. Chairman of this session was Dr. F. W. Parker, assistant Chief of the Bureau of Plant Industry, Soils, and Agricultural Engineering, U.S.D.A., Beltsville. Appearing on this section of the program were Dr. Emil Truog, University of Wisconsin; C. E. Marshall, University of Missouri; Lyman A. Dean, U.S.D.A., and Roy Overstreet, University of California.

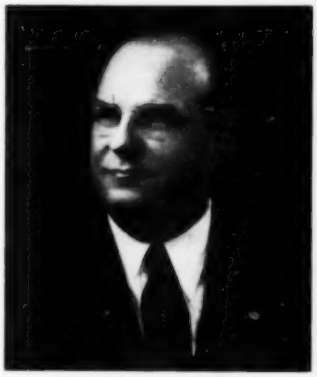
This section was continued on September 2, in a session with Dr. Firmen E. Bear as chairman. Papers were presented by Dr. Hans Jenny, University of California; J. B. Page, University of Ohio; G. B. Bodman, University of California; and A. G. Norman, U. S. Army Chemical Corps., Camp Detrick, Maryland.

(Continued on next page)

V-C Elects Howell Pres.

Joseph A. Howell was elected president of Virginia-Carolina Chemical Corporation at a special meeting of the company's Board of Directors held in Washington, D. C., on September 16.

Mr. Howell, who succeeds the late A. Lynn Ivey, has been executive vice-president and director of the Richmond concern since 1944.

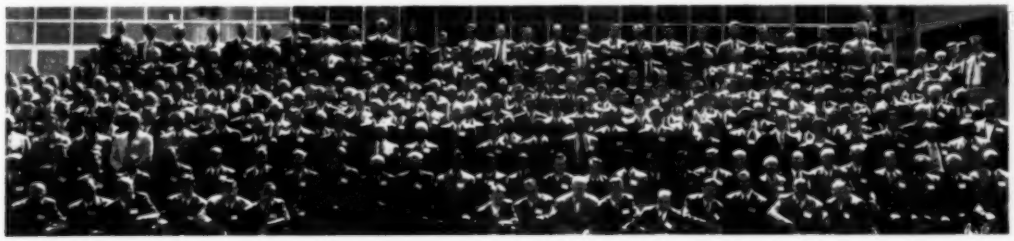


Joseph A. Howell

A native of Alabama, he began his V-C career in 1922 as a salesman in the Mobile, Alabama, office.

He came to Richmond in 1936 as Southern sales manager, and a year later was named general sales manager. Mr. Howell was elected vice-president in charge of sales in 1938, and served in that office until his election as executive vice-president and director in 1944.

The new V-C president has also served as president of Tobacco By-Products & Chemical Corporation, a wholly owned subsidiary of V-C, since 1946. He is a director of the Bank of Virginia, the American Plant Food Council, and a member of the executive committee of the Richmond Chamber of Commerce.



Below: Group attending Wisconsin symposium at Madison last month.

Dr. F. Skoog, Univ. of Wisconsin, was chairman of the session on the entry and translocation of mineral nutrients in plants, Friday afternoon. Papers were presented by Dr. Hans Burstrom, University of Lund, Sweden; T. C. Broyer, University of California; and Dr. O. Biddulph, State College of Washington.

An evening program featured an address by Dr. Russell Coleman, president, the National Fertilizer Association, Washington, D. C.; Damon Boynton, Cornell University, and Jackson Hester, Campbell Soup Co.

The role of minerals in plant nutrition was discussed at the Saturday morning session, of which Dr. Paul J. Kramer, Duke University, was chairman. Three speakers presented papers in this section. These were D. I. Arnon, University of California; W. F. Loehwing, University of Iowa; and R. A. Steinberg, U.S.D.A., Beltsville.

The final session was held Saturday afternoon.

Milwaukee Conference Held

According to the advance program, the 25th annual meeting of the National Joint Committee on Fertilizer application and the American Society of Agronomy was to include the presentation of some 14 papers at its session on October 24 at Milwaukee, Wisconsin.

Included on the program were Ove F. Jensen, E. I. duPont de Nemours & Co., Inc., Wilmington, Del.; Glenn A. Cumings, U. S. Department of Agriculture; Robert H. Engle, National Fertilizer Association, Washington, D. C.; O. E. Sell, Georgia Agricultural Experiment Station; Arnold W. Klemme, Missouri Agri. Experiment Station; and H. R. Lathrope, Indiana Agri. Experiment Station.

The afternoon session was to consist of talks by B. A. Krantz and R. W. Pearson, U. S. Department of Agriculture; P. E. Grubb, DeKalb Agricultural Association, Inc.; F. H. Leavitt, Shell Chemical Corp., Modesto, Calif.; W. E. Colwell and Samuel Tisdale, N. Carolina Agricultural Experiment Station; E. R. Purvis and F. E. Bear, New Jersey Agricultural Experiment Station; S. R. Olsen, Colorado Agri. Experiment Station; N. S. Hall, North Carolina Agri. Experiment Station; R. H. Bray, Illinois Agri. Experiment Station and Fred V. Grau, U. S. Golf Association, Greens Section. A period for discussion was to follow the presentation of each paper.

N. J. Fertilizer Conf. Held

The New Jersey Fertilizer Conference, scheduled to be held on September 29, at Rutgers University, New Brunswick, N. J., was to feature a number of notable speakers at its one-day session. Dean W. H. Martin was to address the group; Stacy B. Randle was to discuss what the fertilizer law requires; Harold Evans, "Molybdenum—One More Minor Element"; and E. R. Purvis, "New Developments in Soil Testing."

Dr. Russell Coleman, president,

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National Fertilizer Association, was scheduled to discuss the role of fertilizer in the permanent agricultural program; Graham Campbell, "Fitting the Fertilizer to the Farm;" and Dr. Firmen E. Bear, "Bread from Stones."

•

Gran Resigns from A.P.F.C.

Cedric G. Gran resigned his position as assistant to the president of the American Plant Food Council effective September 1, according to an announcement by the Council in Washington, D. C. Mr. Gran joined the Council staff in November 1946. He is well known throughout the fertilizer industry for his wartime service as head of the agricultural chemicals pricing section of the Office of Price Administration. At the time he was employed by the Council he was acting head of the grains, cereals and agricultural chemicals pricing branch.

•

Nat'l Fertilizer Ass'n to Meet

Spokesmen for the National Fertilizer Association, Washington, indicate that a full program is being planned for the group's annual fall meeting, but at press time, no announcement of program details had been made. The conference will continue three days, beginning Monday, November 14 at the Atlanta Biltmore Hotel, Atlanta, Georgia. The Association has requested that reservations be made directly with the hotel for the meeting.

•

New Mathieson Plant Runs

Production of "substantial tonnages" of fertilizer materials is under way at the newly-completed facilities of Mathieson Chemical Corp. at Baltimore, Md. The new plant, recently completed, is producing synthetic ammonium sulfate. None of the present output is being offered to the chemical industry, the company states, since the material is earmarked for government export.

Later, when the government program is terminated, Mathieson plans to divert the facility to production of by-products or other agricultural chemicals, a company spokesman said.

•

New Plant in Tennessee

The Shelton Fertilizer Company has been organized at Covington, Tenn., to handle liquid fertilizers. The incorporators are H. B. Shelton, J. C. Jetton, M. B. Howard and W. O. Allison. Construction work was to begin early in September, with the erection of two 60,000-gallon storage tanks.

•

N. Z. Government Lifts Controls

The government of New Zealand has removed its controls over the sales of both mineral and organic fertilizers, according to an announcement by Edward Cullen, Minister of Agriculture of New Zealand. This move, which became effective July 1, ended the wartime rationing which became necessary in 1941 because of war conditions. During the fertilizer year, July 1, 1949 to July 1, 1950, New Zealand expects to import a total of 450,000 tons of raw phosphate rock, Mr. Cullen says.

•

Calif. Fertilizer Meeting

The 25th annual meeting of the California Fertilizer Association is scheduled for November 7, 8 and 9, at the Palace Hotel, San Francisco. Elmer S. Nelson, Association Secretary, has announced that speakers will include Allen B. Lemmon, Chief, California Bureau of Chemistry; W. E. Martin, soils specialist, Berkeley, Calif.; E. F. Wallihan, U. of California Citrus Exp. Station, Riverside; and Oscar A. Lorenz, Univ. of California, Davis.

Dr. L. D. Batchelor, director of the Riverside Experiment Station is scheduled to speak on Tuesday morning, as is Paul Pauly, Pacific Guano Co., Los Angeles. Mr. Pauly will read the minutes of the 24th annual meeting. Wallace MacFarlane, president of the C. F. A., will also present his address to the group that day.

Hans Jenny, professor of soil chemistry, University of California, will present data on the fertility levels of California soils as indicated by pot tests, to complete the morning's agenda.

Tuesday afternoon will see a continuation of the sessions, with A. D. Shamel, Riverside, Calif., looking back on fifty years of observation on fertilizer practices. C. T. Prindeville, Swift & Co., Chicago, will speak briefly, followed by M. E. McCollam, American Potash Institute.

Another guest speaker to appear on Tuesday afternoon, is George W. Scarseth, director of research, American Farm Research Association, Lafayette, Ind. Mr. Scarseth topic will be "Fertilizers, Food, Fun, Freedom and the Future."

ACS MEETING

(Continued from page 44)

ers and four per cent of all materials used separately were consumed in enterprises other than farming in the U.S., they reported. Such uses included home gardens, golf courses, cemeteries, etc. The total amount used for such purposes was 343,218 tons. The leading grade of non-farm fertilizer was 5–10–5. Of the separate materials used, dried manures and sewage sludges represented more than 50 per cent, it was stated.

Economic Poisons Section

UNDER the chairmanship of Dr. J. L. St. John, Pullman, Washington, the Section on Economic Poisons got under way Wednesday morning and continued through the day. L. S. Hitchner, executive secretary of the National Agricultural Chemicals Association, Washington, D. C., reminded the group that the increased food production in the U.S. has not been due to increased plantings, but rather, to a steadily increasing yield per acre, due in part to the use of pest control chemicals. He emphasized the proper use of pes-

ticides, pointing out that full efficiency may be reached only when these materials are applied correctly and in the proper concentrations. The reduction of costs plus a marked increase in production efficiency was reviewed by Mr. Hitchner who presented statistics to show the relationship of higher yields to the proper selection and use of pesticides, both old and new.

The cooperation of the chemist, toxicologist, physiologist, pharmacologist, manufacturer and entomologist in providing data on new insecticides was described by Dr. Charles E. Palm, Department of Entomology, Cornell University. Because of the variety of new chemicals which prove to be effective in killing insects, confusion seems logical since there has not been ample time for complete evaluation of all essential factors involved.

Mere insecticidal effectiveness is but one consideration in making recommendations for use. Entomologists must rely upon co-workers for information regarding safety of the material to those handling and applying it, possible harmful residues, safety of the material to the host plant or animal, off-flavors, destruction of beneficial organisms, etc., he said.

John H. Foulger, Haskell Laboratory of Industrial Toxicology, Wilmington, Del., emphasized the importance of toxicological investigations of pesticides by industry. He said that existing facilities cannot meet the demand for all the toxicological information needed at the present time, since statutes regulating the sale and use of chemicals, plus workmen's compensation laws, combine to demand increasing information on health hazards. Such information is best gathered by laboratories established by industrial companies, individually or cooperatively, he declared. The final correlation and interpretation of data in terms of human hazard are best made by individuals or committees qualified in medicine as well as in pharmacology and toxicology, it was pointed out.

The toxicological action of chlordane was described in a paper by Drs. E. F. Stohlman and M. I. Smith, National Institute of Health. They stated that the LD50 of chlordane in oral administration in rats and rabbits is not significantly different from that of DDT, while the chronic toxicity of chlordane in rabbits on continued administration of subtoxic doses is much greater than that of DDT due to greater cumulative action. Post mortem findings in chronic chlordane poisoning are characterized by parenchymatous degeneration of the liver and kidney, the paper stated. In acute poisoning, pulmonary edema and enteritis dominate the picture. Death may be delayed for many days following a single oral toxic dose, it was stated.

Concentrations of DDT found in eggs and the tissues of chickens after feeding the hens varying

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amounts of the material, were described in a paper by M. J. Bryson, C. I. Draper, J. R. Harris, Clyde Biddulph, D. A. Greenwood, Wayne Binns, M. L. Miner, L. E. Harris and L. L. Madsen, Utah Agricultural Experiment Station, Logan, Utah. Alfalfa, dusted with varying amounts of DDT was ground into meal and later fed to hens as mash for one year. Mash containing 200 ppm DDT, resulted in as high as 66.5 ppm DDT in eggs. In the hens themselves, the greatest amount of DDT was found in the fat, with much smaller amounts in leg and breast muscle tissue.

Similar experiments with dairy cows fed DDT-dusted alfalfa hay were reported by the same authors in a subsequent paper. Analysis of the milk showed the prompt appearance of DDT after the cows began eating the DDT-treated hay. The count reached 12.5 ppm of DDT in the milk when the cow was fed alfalfa which had been dusted with four pounds of DDT per acre. DDT persisted in the milk for four months after feeding of DDT-treated hay was discontinued.

A discussion of the types of spray oils best suited as horticultural insecticides was presented in a paper by G. W. Pearce and P. J. Chapman, U.S.D.A. They pointed out that although petroleum spray oils have been used a long time for the control of horticultural pests, their effectiveness depends on the general structural composition and molecular size of the hydrocarbons present. Thus, for oils of the same average molecular weight, efficiency increases as paraffinic character increases, they said. It was concluded that the ideal hydrocarbon spray oil should consist of the most highly paraffinic hydrocarbons having a molecular size of 23 to 24 carbons per molecule.

NACA MEETS

(*Continued from page 30*)

critical," he warned. "But we can attack and solve all our problems successfully through the coordination of industry," he concluded.

"Bugs or Residues"; Rohwer

IN his extemporaneous talk, Dr. S. A. Rohwer, assistant chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington, reminded his audience that a tremendous problem looms in the forthcoming hearings. He stated that it is difficult to gain a full realization of what is involved. The Food and Drug Administration, he reminded, is responsible for keeping insect debris out of food; and also for keeping foods free from deleterious chemical residues. The F.D.A. is therefore faced with a choice of which condition is less objectionable. He told the industry representatives that it must be decided what chemical substances are actually required for the production of foodstuffs, and stated that perhaps only a part of those now in use are indispensable. Good reasons must be presented for the continued use of some materials, he warned, and suggested that the industry begin to think along this line.

Dr. Rohwer pictured how the use of "minor" ingredients, ordinarily regarded as inert, has an increasing bearing on the end use of an insecticide. He said that the concept of these minor ingredients must be revised, and insecticides must be tested as they are used, rather than merely stating on labels that "so much of this or that" is contained in a given product.

Sound, safe pest control is more than a study of toxicology, Dr. Rohwer declared. In addition to its toxicological properties, a pesticide must be studied in relation to its effect on the soil, on farm animals, plants and public health. The end result is the production of safe foods . . . safe from both an economic and health standpoint. He said further, that over-emphasis of one phase of pest control makes possible the over-looking of other important aspects of the problem. "The field should be seen from a broad point of view," he continued.

In conclusion, he commended the pesticide industry for a job well done in 1949. Despite some local shortages of materials, the over-all record was good, he recalled.

The annual banquet was held on Thursday evening at the hotel. No formal program was arranged for the occasion, other than the awarding of golf prizes. Cool weather and unusually rough surf cut down on the number of bathing devotees, but the beach was noticed to be fairly well populated.

HEARINGS

(*Continued from page 42*)

Food and Drug Officials 127.) In a broad way, Dr. White voiced our concern over the increase in the addition of inadequately tested and potentially toxic chemicals to foods.

In June 1948 Dr. Lehman, Chief of our Division of Pharmacology, delivered a paper on "The Toxicology of the Newer Agricultural Chemicals" before the Annual Conference of the Association of Food and Drug Officials. (12 *Bul. Assn. Food and Drug Officials* 82.) In 1949 Dr. Lehman brought the subject up to date by setting forth the newly acquired data which had become available after June 1948. This paper was titled "Pharmacological Considerations of Insecticides" and was delivered before the meeting of the American Chemical Society in San Francisco. (13 *Bul. Assn. Food and Drug Officials* 65.)

In December, 1948, the Deputy Commissioner, Mr. Crawford, spoke at the annual meeting of the American Association of Economic Entomologists on the subject "Pesticides and the Food Law." (4 FDC *Law Quarterly* 132.) And last May, the Commissioner, Dr. Dunbar, spoke at the N.A.C.A. meeting at Rye, New York, on the subject "The Food and Drug Administration Looks at Insecticides." (4 FDC *Law Quarterly* 233, and *Agricultural Chemicals*, June, 1949.)

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of its sixteen field districts to confer with state and other local officials, experiment station and university people and others who are likely to be interested in hearings to establish tolerances for insecticidal residues on fruits and vegetables. These are mentioned as examples of idea-sharing to recognize the problem which gives rise to the need of tolerance rules.

The industry has also been exploring the problem. It seems well agreed that enough factual data will soon be available so that some good workable rules may be set up, which, in the words of the Congressional report, will meet the needs of industry and protect the public health.

Official Announcement First

THE next step is to publish a formal notice of hearing in the *Federal Register*, setting forth the proposal in general terms. This notice will also announce the date of the hearing, the room number in the Federal Security Building in Washington where the hearing will convene, and give the name of the presiding officer designated by the Administrator to conduct the hearing. Although we naturally cannot speak for the Administrator, it can be said that the Food and Drug Administration favors a proposal framed in terms general enough to permit taking evidence on all the poisonous or deleterious substances which are likely to be required for the commercial production of fresh fruits and fresh vegetables. We do not think that the proposal should restrict the hearing to apples and pears. We think that it would be advisable to re-open the question of a tolerance for fluorine compounds in insecticidal residues.

To Gather Evidence

AFTER the announcement is published, evidence for presentation at the public hearing must be lined up. We think that the industry and the entomologists can be very helpful in furnishing facts about which fruits and vegetables require poisonous or deleterious substances in their commercial production, what are the pests or conditions which must be controlled and what particular substances are needed for such control. We hope that producers of the foods upon which the poisonous or deleterious substances are used can furnish data on the extent to which the poisons can be avoided by washing, brushing, or other means of removal. The F.D.A. can be helpful by furnishing the toxicity data on the substances required. This serves as a rough outline of some of the sources of evidence.

Furnish Five Copies

AT the hearing witnesses testify under oath. Some witnesses write out what they have to say or prepare outlines of their proposed testimony. Others put in their evidence by answering questions asked by their attorneys. Tabulations of data are usually offered as exhibits.

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Witnesses should have at least five copies of each exhibit which they intend to offer in evidence. We think it is good practice to have several additional copies for distribution to those in attendance at the hearing who are interested in the exhibit.

All witnesses are subject to cross-examination.

All testimony is recorded by a private reporting firm. The firm which has the contract for this fiscal year is the Acme Reporting Company of Washington, D. C. and they sell copies of the transcript. Parties who wish to buy copies make their arrangements with the reporter at the hearing. The presiding officer routinely affords the parties of record an opportunity to present for the Administrator's consideration recommended findings of fact, and suggested regulations. These are written and are accompanied by briefs.

After the record has been studied and the suggested findings and regulations considered, the Administrator publishes in the *Federal Register* a tentative order incorporating the rules which he proposes to make. The tentative order appears in that part of the publication headed "Proposed Rule-Making." To this tentative order parties of record who may have exceptions, are given an opportunity to file them and briefs in support of their exceptions. These exceptions are considered and then a final order is published. The final order carries a notification of the date when the regulations established by the order will take effect. Unless an emergency situation exists, the effective date is not less than 90 days following the issuance of the final order. Normally, this ends the rule-making procedure.

Section 701(f) of the Food, Drug, and Cosmetic Act provides that in case of actual controversy as to the validity of the order, any person who will be adversely affected may, prior to the ninetieth day after such order is issued, file a petition for judicial review of the order with the Circuit Court of Appeals for the circuit where he of business. There have been judicial reviews of a number of the orresides or has his principal place ders which have resulted from rule-making hearings under our Act. These are all reported cases. The most recent one involved a review of the canned oyster regulations by the Ninth Circuit Court of Appeals. (Willapoint Oysters, Inc. v Ewing 174, F. 2nd 676.) Judge Bone wrote a long and informative opinion. Among other things he makes it clear that he regards our procedure as one of rule-making and not one of adjudication.

The regulations which have been worked out by the procedures outlined here, have established good rules. As an evaluation of this procedure, I should quote a statement made by Mr. Crawford before the Section of Food, Drug, and Cosmetic Law of the New York Bar Association. He said:

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"As a layman in law, the basic meaning of § 701 (e) to me is that the government shall deal fairly and honestly and above-board in its regulation- making process. I think all of the provisions of the section are directed toward that simple objective.***

"It is my observation that the process of public hearing, review of briefs and arguments on the record, publication of a proposed order, and review of exceptions to it before promulgation of the final order, lead to infinitely better regulations, from the standpoint of both the public and industry, than could possibly result from any other scheme." (2 F.D.C. *Law Quarterly*, 3, 9, 10)

The F.D.A. has no desire to play the part of judge, jury, nor prosecutor in the days to come. Rather, we want to be co-laborers with the industry in developing the facts at the public hearing. Since we have a job to do, together, let's do it!

TECHNICAL BRIEFS

(Continued from page 55)

ing their action. However, vascular discoloration was found in the potatoes, following use of all materials or methods used and definite varietal differences were noted as to the amount of discoloration present. Chippewas were most severely discolored, Green Mountains the least, with cobblers and Katahdins intermediate.

Cyanamid "Aerodefoliant," which killed stems slowly, gave the most discoloration, while "Sinox," which gave an intermediate to slow rate of kill, gave the least discoloration. Other factors than the materials might cause the discoloration, it was suggested, such as variety, maturity of the vines, soil temperature and moisture and possibly air temperature and humidity in the days following application of the top killer. On potatoes in storage discolorations observed at harvest time had faded when potatoes were cut in December and were nearly all gone in March.

INSECT SITUATION

(Continued from page 51)

August, except for a few counties in several states. The surveys have shown that egg beds of one grasshopper species, *Melanoplus occidentalis* (Thos.) cover a total of 1,011,480 acres of range in northwestern Nevada and southeastern Oregon. Only 155,520 acres in those states were found infested in last year's survey. This species has been estimated to have destroyed $1,556,000 worth of forage in 1949.

Severe infestations of grasshoppers occurred in areas of Adams, Idaho, Kootenai, Latah, Lewis, Nez Perce, and Washington Counties of Idaho. Damage up to 30 percent had occurred to grains, alfalfa, pastures, and some truck crops in some localities there.

In California, the results in counties where surveys were completed indicate the possibility of a situation in 1950 similar to that of this year, with some localized hot spots within the area. Infestations of generally little economic importance occurred in Grant, McKinley, and the western portion of Valencia Counties in western New Mexico. In the eastern part of that

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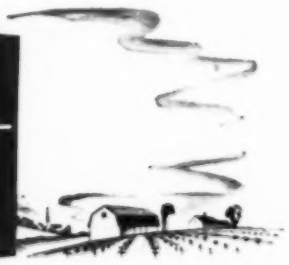

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State infestations of a serious nature were present both in cropped areas and on rangeland.

The surveys have shown that grasshopper infestations in Montana increased considerably this year in Blaine, Hill, Lincoln, and Phillips Counties, while a decrease occurred in Chouteau, Pondera, Teton, and Toole Counties. Preliminary indications from the adult survey completed on range areas of Wyoming are that the large-scale grasshopper control program there was highly successful, not only in saving much of this year's grass crop, but also in helping to prevent heavy deposition of eggs. Large-scale flights from the area were also prevented.

In Utah surveys showed infestations to be spotted. Grasshopper populations, however, were heavier than last year. Baits and organic insecticides were still being applied late in August for the protection of alfalfa seed crops in scattered parts of the State. In Colorado, the heaviest infestation was found in the southeastern corner of the State.

Surveys in Kansas showed the infestation, for the most part, to be lighter this year than in 1948. Baiting was on the increase in late August, although fall wheat had not yet started to come up over much of the western Kansas area. The adult survey indicated that infestations in Missouri were generally lighter than last year, and that little crop damage occurred anywhere in the State. Infestations in northeastern Oklahoma were generally not of economic importance. Surveys in Texas showed grasshopper infestations to be generally light in much of the southeastern part of the State, and also in those counties surveyed during August in the panhandle and north-central area.

RIBES CONTROL

(*Continued from page 35*)

2,4-D. Under the discussion on "seasonal development" it was pointed out that spray work could be effective over a longer seasonal period on young than on old plants. As indicated by figure 2, any soil, climatic, or vegetational factor that reduced moisture available to ribes, or modified the soil temperature so as to hasten seasonal development, will tend to shorten the period of high susceptibility of ribes to 2,4-D. Thus in scheduling practical spray work, ribes on south and southwest slopes, especially on shallow and rocky soils, should be sprayed earlier in the season than should ribes on deep, moist soils in flat sites or on north and northeast slopes. Ribes grow slower and become resistant to 2,4-D earlier in the season in heavy brush than in open sites, or in areas where little or no deep-rooted vegetation is in competition with them.

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erally a measure of the ability of a plant to recover from chemical damage. It is not surprising, therefore, that deep-rooted or old ribes plants are harder to kill with 2,4-D than are younger bushes.

Dosage

SUSCEPTIBLE ribes at the favorable time in the growing season can be killed by sprays containing as little as 250 p.p.m. of 2,4-D acid, and a lethal dosage at this concentration is contained in the smallest volume needed to wet thoroughly all stems and leaves. Lethal dosage, or total weight of chemical needed to kill a unit weight of plant tissue, is the product of volume and concentration and may be deposited on a ribes bush by small volumes of concentrated solution or by large volumes of dilute spray. In practical field work with conventional sprayers, a concentration of 750 p.p.m. of 2,4-D acid and thorough coverage of foliage plus an auxiliary crown drench have been recommended for *R. roezli* in California and *R. petiolare* in Idaho for early season work. With the advent of settled early summer weather this concentration is reduced to 500 p.p.m. 2,4,5-T must be used at a concentration of 2,000 p.p.m. or more for effective results on most ribes. The volume generally applied has been about 10 gallons of dilute spray per square rod for ground entirely covered with ribes. Nevertheless, highly concentrated sprays of 2,4-D and 2,4,5-T are fully effective on ribes. Thus, low volumes of concentrates applied by mist blowers or aerosol generators are effective provided that the mist covers the plants thoroughly.

For each susceptible *Ribes* species there is a minimum concentration of 2,4-D or 2,4,5-T acid that must be attained for effective kill. *Ribes nevadense* and *R. cereum* in California are susceptible to 2,4-D, but cannot be killed by concentrations as low as 250 p.p.m., a concentration lethal to *R. roezli*. The first two species require a minimum of 500 to 1,000 p.p.m. for optimum killing action. When mixed species are being sprayed, the concentration of 2,4-D will be determined by the needs of the least susceptible species. For highly susceptible species increasing the concentration of dilute sprays beyond a reasonable margin from the minimum toxic concentration serves no useful purpose and only increases the damage to less susceptible plants associated with the ribes. 2,4,5-T exhibits a more clear-cut concentration effect than 2,4-D; for most ribes resistant to 2,4-D a concentration of about 2,000 p.p.m. of 2,4,5-T is needed for good results from aqueous or oil sprays applied with conventional spray equipment.

Formulations

EXTENSIVE field tests on the formulations of 2,4-D in relation to ultimate toxicity show that the salts and esters at equivalent concentrations of the acid are about equally toxic to ribes. Thus considerations of cost, availability, bulk, and toxicity to associated crop plants can be given fullest consideration in the light of special needs of the field job.

The killing action of 2,4-D on ribes can be modified by varying the concentration and dosage of the spray solution by the addition of acid, alkali, oil, other herbicides, or detergents, and by the use of activators, diluents, markers, or fillers. With the exceptions noted elsewhere in this report, these modifications in formulation have meant changes in the *rate* of killing of leaves and stem, rather than significant improvements in final bush kill. The following important exceptions regarding the significance of formulation should be noted: (1) During early season field work, when there are likely to be rains, the esters of 2,4-D may be more effective than the water-soluble salts. (2) Because of possible dilution below the critical minimum, early season sprays should be more concentrated than those used after rains have ceased. (3) Towards the end of the effective spray season the reduction in toxicity can be minimized by using 2,4-D mixtures containing emulsifiable oil or kerosene that help in the penetration of the hardening plant tissue.

Crown Sprouts and Partially Killed Bushes

CROWN sprouts and partly killed bushes also must be sprayed during the seasonal period of high susceptibility. This period begins about 2 weeks later in the spring than for plants not previously sprayed, and continues as long as the sprouts show vigorous growth. Since living root crowns do not all sprout at the same time, it is good field practice to delay respray work until about mid-point in the growing season.

Crown resprouts and partially killed ribes can usually be attributed to one or more of the following. (1) Failure to treat during the susceptible period of growth. At the beginning and end of the growing season, more individuals of any ribes population may be in the nonsusceptible growth stage because of local variations in climate and soil. Towards the end of the growing season 2,4-D may kill 100 percent of the aerial stem, apparently killing the treated plants; the following year, however, all or most of these plants may produce vigorous crown sprouts. (2) Failure to get complete spray coverage of all stems and leaves. (3) Genetic and varietal differences of individuals in a population of susceptible ribes. (4) Insufficient chemical, i.e., spray solutions below minimum lethal concentration for the particular species being treated, or too small a volume of spray solution to permit thorough wetting of all stems and leaves. (5) General low susceptibility of the *Ribes* species to 2,4-D sprays.

Seed Viability

THE viability of ribes seed is destroyed by low concentrations of 2,4-D. Ribes seeds are hard-coated and will retain their viability through several weeks of immersion in many of the inorganic acids, alkalis, and plant poisons.

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Immersion of unplumped *R. roezli* seed for 24 hours in aqua regia containing some 15,000 p.p.m. of total acid reduced germination of seed to 79 percent from a normal of 90 percent. By contrast, 24 hours immersion of dry, unplumped *R. roezli* seeds in 1,000 p.p.m. of 2,4-D acid resulted in only 14 percent germination, and 200 p.p.m. for 48 hours prevented germination. Immersion of dry *R. roezli* seeds in 60 p.p.m. of 2,4-D for 4 days reduced germination to 1 percent from a normal of about 90 percent. Mitchell and Brown (*10*) emphasize the importance of the condition of the seed with respect to its sensitivity to 2,4-D. Mustard seed, insensitive to 2,4-D in its fully dormant condition, is readily damaged after the seed coat breaks and the root emerges.

Numerous *R. roezli* seedlings were commonly noted under parent *R. roezli* bushes killed the previous year by 2,4-D sprays applied in May and June. By contrast, mid-July and August killing of mature *R. roezli* with 2,4-D has resulted in little or no establishment of seedlings the following year.

Practical Application

SUSCEPTIBLE ribes have been killed by 2,4-D herbicides applied as follows: (1) Spraying leaves and stems of intact plants with dilute aqueous solutions, or with oil concentrates of 2,4-D in low volumes as a fine mist or aerosol, and spraying or wetting only the basal portion of the intact or or scarified stems. (2) Dusting of stems and leaves of intact plants. (3) Decapitating the plants at or near the ground line and applying liquid or dry herbicide direct to the crown or to the short stub ends of cut-off stems.

Spraying Intact Plants. In the Pacific coast region truck-mounted power sprayers were used for the practical spray work on 1,554 acres of *R. roezli* and *R. nevadense* reported in table 1.

The use of large volumes of dilute aqueous spray applied by power sprayers is considered to be the most practical field method for treating large numbers of ribes accessible to roads or motorways. The plunger-type spray pump is best adapted to the use of sprays containing the insoluble white marker. In selective spraying of ribes the use of a marker, plus the adequate volumes of spray solution available from the large truck-drawn sprayer, are helpful factors in the effective use of transient and inexperienced labor that must be depended upon each year for the short spray season. An insoluble marker, such as "Titanox B-30," cannot be used effectively unless agitation is provided. For uniform broadcast spraying of ribes and associated brush the marker is of doubtful value.

The 5-gallon knapsack trombone pump unit (*11*, pp. 44–45), used for many years in Idaho for applying chlorates and sulfamates has been successful in applying dilute aqueous 2,4-D to *R. petiolare*.

A new type of high-pressure sprayer, called the Hi-Fog[4] applicator, was used during the 1947–48 field seasons in Idaho, Oregon, and California. This knapsack applicator is designed for applying low volumes of 2,4-D concentrates in aqueous or oil solution at pressures ranging from 300 to 1,000 pounds per square inch.

Tests conducted in 1947–48 with the Hi-Fog applicator showed that it is especially well adapted to the treatment of crown sprouts in respray work and to initial spraying of medium to large ribes of scattered distribution, especially those in brush or along streams or rocky terrain where laying and moving hose lines is troublesome.

Dusting Intact Plants

HIGHLY susceptible Ribes species can be killed by 2,4-D dusts applied during the favorable part of the growing season. Two types of power dusters and several types of hand-operated dusters have been used on experimental plots for ribes eradication. The use of dusts will probably be restricted to isolated patches of ribes not readily accessible by road to power-spray equipment or to light-knapsack equipment.

[4] Manufactured under patent by Ranta and Driscoll Company, Los Angeles, Calif.

Treating Individual Bushes

DECAPITATION and chemical treatment of large, rock-bound or otherwise troublesome ribes as an auxiliary method to regular digging or pulling work has been an established procedure for blister rust crews for the past 12 years (*11*). Aqueous or oil 2,4-D concentrates applied directly to the freshly exposed tissue of cut-off crowns are fully effective on highly susceptible ribes. Results may be less dependable on moderately susceptible and resistant ribes; these species must be cut closer to the crown and treated more generously with higher concentrations than must the susceptible ribes. Because of the small weight and volume of 2,4-D needed to kill the decapitated ribes, it has been possible to extend greatly the scope of the decapitation work. 2,4-D dusts may be used in place of liquids, but the dry powders cannot be applied so economically as liquids. A pocket-size (4 to 8 ounces) oil can having a screw-on spout or removable top (making the can refillable) is a cheap and effective container and applicator. The bush is cut off at the ground line (or within 3 inches of the crown) by means of pruning shears, Pulaski tool, or mattock, and the cut surfaces of crown and stems are liberally wet with the 2,4-D concentrate. The solution most generally recommended for field use contains 5 percent of 2,4-D ester in Diesel oil.

Field tests made during 1947 indicate that *R. nevadense* can be killed by wetting thoroughly the intact basal stems of the plant with esters of 2,4-D dissolved in pure kerosene. Concentrations of 5, 10, and 20 percent of 2,4-D ester-in-oil were effective. Equally good results were obtained by scratching or scarifying a few inches of the basal portion of several of the principal stems and then wetting all basal stems as with the intact plants.

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AN EMULSIFIER OF PETROLEUM OILS

Economical - Effective

MUL SI-MO is especially adapted for the rapid emulsification of Oils whose viscosity is 120 Saybolt or less.

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Oils with a viscosity of 120 Saybolt or less cover the great majority of oils used in Dormant and Summer Sprays.

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There is nothing complicated about the use of *Mul-si-mo*. It is just poured into the oil to be treated at the rate of ½ to 1%, depending upon the tightness of emulsion desired—then thoroughly stirred—and the process is completed.

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A practically 100% Oil Product—No Water—No Soap—No Potash nor other Alkalines.

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Mul-si-mo, we believe, is the cheapest and most economical Emulsifier on the market for the emulsification of the oils above specified.

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Extensive tests have shown *Mul-si-mo* to be non-toxic to plants when used at a dilution of 1 to 100. (Plants used in tests —Coleus.) As summer oils are usually used at the dilution of half-gal. to 100 gals. water, at such dilution the rate of *Mul-si-mo* to water would be 1 to 20,000.

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This method of treatment should be most practical for ribes, such as *R. nevadense* and *R. cereum*, that have large bushy tops and woody upright stems tending to merge into a few large principal stems near the crown.

SUMMARY

Results from greenhouse and field work completed during 1944–48 are summarized to show the importance of season, formulation, dosage, and method of application of 2,4-D and 2,4,5-T in relation to the effective use of these nonhazardous herbicides for ribes eradication. The two methods of treatment now in general use are spraying intact plants with dilute aqueous solution (250 to 1,000 p.p.m. for 2,4-D and 2,000 p.p.m. for 2,4,5-T) acid equivalent, and decapitating individual plants and applying ester or amine concentrates (1 to 20 percent) in oil or water to the freshly cut surface of the root crown.

Of the 29 *Ribes* species on which 2,4-D tests were made, only *americanum, bracteosum, cereum, nevadense, petiolare, roezli,* and *speciosum* can be effectively and economically killed by dilute 2,4-D sprays applied to aerial plant parts. Several *Ribes* species (*binominatum, inerme, lacustre, lobbii,* and *triste*) that cannot be readily killed by 2,4-D can be killed by 2,4,5-T sprays. Susceptible ribes are not killed by dilute sprays unless all stems and leaves are thoroughly covered. Effective work even on susceptible species can be done only when the plants are actively growing. For mature bushes of most *Ribes* species this period corresponds to the interval between the time the leaves are fully expanded until the fruits are about two-thirds grown.

Ease of killing plants of a susceptible species varies with age, growth, rate, and vigor. Old, slow-growing plants are the hardest to kill and have a shorter period of susceptibility during any one growing season than have young, fast-growing plants.

In the selective spraying of ribes in California, a brilliant white titanium pigment is used as a marker at the rate of 1 to 1½ pounds per 100 gallons of 2,4-D spray solution.

Literature Cited

(1) Craig, George A. 1946. Chemical war waged on blister rust. Timberman 47: 39, 74, 76, illus.
(2) Crafts, A. S. 1948. Results of soil treatment vs. contract sprays in corn and cane weed control. Agr. Chem. 3: 25–27, 81, 83, 85, illus.
(3) Egler, Frank E. 1947. Effects of 2,4-D on woody plants in Connecticut. Jour. Forestry 45: 449–452.
(4) Hamner, C. L., and H. B. Tukey. 1946. Herbicidal action of 2,4-dichlorophenoxyacetic acid on several shrubs, vines, and trees. Bot. Gaz. 107: 379–385.
(5) Hanks, R. W. 1946. Removal of 2,4-dichlorophenoxyacetic acid and its calcium salt from six different soils by leaching. Bot. Gaz. 108: 186–191.
(6) Harvey, W. A., and W. W. Robbins. 1947. 2,4-D as a weed-killer. Calif. Agr. Col. Ext. Cir. 133 (Rev.), 12 pp., illus.
(7) Lucas, E. H., and C. L. Hamner. 1947. Inactivation of 2,4-D by adsorption on charcoal. Science 105: 340.
(8) Marth, P. C., and F. F. Davis. 1945. Relation of temperature to the selective herbicidal effects of 2,4-dichlorophenoxyacetic acid. Bot. Gaz. 106: 463–472.
(9) Mitchell, J. W., R. E. Hodgson, and C. F. Gaetjens. 1946. Tolerance of farm animals to food containing 2,4-dichlorophenoxyacetic acid. Jour. Anim. Sci. 5: 226–232.
(10) Mitchell, John W., and James W. Brown. 1947. Relative sensitivity of dormant and germinating seeds to 2,4-D. Science 106: 266–267.
(11) Offord, H. R., G. R. Van Atta, and H. E. Swanson. 1940. Chemical and mechanical methods of ribes eradication in the white pine areas of the Western States. U.S. Dept. Agr. Tech. Bul. 692, 49 pp., illus.
(12) Payne, Merle G., and Jess L. Fults. 1947. Some effects of ultraviolet light on 2,4-D and related compounds. Science 106: 37–39.
(13) Thimann, Kenneth V. 1947. Use of 2,4-D weed-killers on woody weeds in Cuba. Science 106: 87.

TOXIC RESIDUES

(Continued from page 27)

when his hopes get out of bounds with some new material. Just as only the general public can uncover defects in automobiles, revolving doors or mousetraps so only the general group of farmers can find the true limitations of pest control materials.

Another aspect of this matter is of importance. Entirely new and unsuspected uses often are found when any farmer who wishes has access to a material. An illustration is the discovery that phenothiazine, which was introduced to control codling moth on apples, is a very useful vermifuge in domestic animals. The FDA looked upon it with grave doubts as an apple spray and doubtless would not approve it under the proposed testing arrangement. Going back in history a little, can anyone imagine the FDA giving approval to hydrogen cyanide or lead arsenate if they were offered as brand new materials today? Yet one of these toxicants has made possible the development of the citrus industry and the other is a boon to the apple industry. It is absolutely certain that any drastic change in the free development and use of new materials beyond those now in effect will have at least three undesirable results: a) less food and fiber, b) inferior produce and c) much higher prices.

A change that should be made as soon as possible is speedier determination of the chronic effects that may be caused by widespread use of materials which come through the long process of development previously outlined. If facilities were available to start feeding tests as soon as selected farmer trials indicated that a new material was useful there would be very little impatience while such tests were going on. There is uncertainty regarding the minimum length of time to determine chronic effects. The FDA prefers two years but other pharmacologists think one year may be sufficient. If the shorter period proves to be sufficient, a great saving in time will be possible.

Since facilities are not now available for such prompt feeding tests, they should be provided as rapidly as possible. A point worth emphasizing is that such tests should not be limited to the chemicals added to ordinary animal diets but should include the actual contaminated agricultural products as they are

obtained from the field and after commercial processing. Such feeding is best done close at hand and hence for western products should be done in the west.

In the use of agricultural chemicals the doctrine of calculated risk may well be taken as a guide. It is a matter of the greatest good for the largest number. The experience of bridge builders shows that one life is lost for each million dollars expanded and this price of progress is considered worth paying. The survey of insecticides as shown in the three tables indicates very clearly that agriculture is able and willing to operate with a very large factor of safety. Most criticism is being levied at the new materials and yet they are used at smaller doses, less often, are less stable and intrinsically are less toxic than the older ones that are being abandoned.

REFERENCES CITED

Barnes, M. M., G. E. Carman, W. H. Ewart and F. A. Gunther.
Fruit surface residues of DDT and Parathion at harvest. Address before 115th meeting of American Chemical Society, San Francisco, March 30, 1949.

Borden, A. D. and H. F. Madsen.
Codling moth on apricots. Calif. Agric. *3*(5) 4, 16 (1949).

Calvery, H. O.
Chronic effects of ingested lead and arsenic. Jour. Amer. Med. Assoc. *111*, 1722–8 (1938).

Hoskins, W. M.
An analytical method for the determination of DDT deposits and residues during 1945 on grapes, pears, spinach and animal hair. Calif. Agric. Exp. Sta. Circ. *365*, 102–3 (1946).

Hoskins, W. M. and P. S. Messenger
A microbioassay method for residues of insecticides in plant and animal tissues. Address before 115th meeting of the American Chemical Society, San Francisco, March 30, (1949).

Lehman, A. J.
The toxicology of the newer agricultural chemicals. Bul. Assoc. Food and Drug Officials *12*, 82–9 (1948).

Lehman, A. J.
Pharmacological considerations of insecticides. Address before 115th meeting of American Chemical Society, San Francisco, March 29, (1949).

Marcovitch, S., G. A. Shuey and W. W. Stanley.
Cryolite spray residues and human health. Tenn. Agric. Exp. Sta. Bul. No. *162*, 46 pp. (1937).

Michelbacher, A. E., W. W. Middlekauff and N. B. Akesson.
Caterpillars destructive to tomato. Calif. Agric. Exp. Sta. Bul. *707*, 47 pp. (1948).

Neal, P. A., W. C. Dreesen, T. I. Edwards, W. H. Reinhart, S. H. Webster, H. T. Castberg and L. T. Fairhall.
A study of the effect of lead arsenate exposure on orchardists and consumers of sprayed fruit. Public Health Bul. No. *267*, 181 pp. (1941).

Parker, J. R.
Annual insect damage appraisal. Jour. Econ. Ent. *35*, 1–10 (1944).

Robinson, A. H.
Spray residues on food crops and their relation to total food consumption. Address before 115th meeting of American Chemical Society, San Francisco, March 30, (1949).

Smyth, H. F. and H. F. Smyth, Jr.
Relative toxicity of some fluorine and arsenical insecticides. Jour. Indus. and Engin. Chemistry *24*, 229–32, (1932).

Sollmann, T.
Studies of chronic intoxications on albino rats. Jour. Pharmacology and Experimental Therapeutics *18*, 43–9 (1921).

PLANT DISEASE

(Continued from page 49)

was observed in beds not treated with bordeaux as recommended, whereas none was present in nearby treated beds. Where wildfire occurred, growers either did not make any treatment or applied the treatments too late. Many untreated beds were completely destroyed by wildfire.

Although still present, the disease became less conspicuous as burley seedlings were hardened for transplanting. Usually, when hardened, the top leaves turn yellow and bottom leaves become completely chlorotic.

Ascochyta Blight in Ga.

D. D. Morey and J. H. Miller of the University of Georgia report that *Ascochyta* blight of cotton has been found in serious proportions for the last three years. The leaf spots and leaf-stalk and stem cankers characteristic of the disease are caused by the fungus *Ascochyta gossypii*.

They report the results of surveys made this spring and early summer in cotton fields in counties surrounding Clarke County, and southward to Thomson, Louisville, Sandersville, Milledgeville, Eatonton, and back to Athens. This is chiefly a Piedmont area. The survey was supplemented by reports from most of the county agents in north Georgia, who sent in specimens and described the disease as of serious consequence in the following counties: Barrow, Clarke, Emanuel, Greene, Habersham, Hart, Jackson, Jasper, Madison, Oglethorpe, Walton, Warren, and Wilkes.

On June 7 the disease was found in all fields between Athens and Louisville, and back to Athens. Plants ranged from six inches to a foot in height. In every case farmers said the cotton came up to a good stand and then started dying. Reduction in stand averaged about 30 percent. The peak of the disease had already been reached and most of the dying took place on younger plants before this date. At the time of the survey, only the middle and bottom leaves showed many spots. The stem canker symptom so common in 1947 and 1948 was very rare this year. No correlation was found between soil type and incidence of disease.

On June 23 a survey was made north of Athens in Madison County. On ten farms the loss of stand was much worse where cotton followed cotton and was not severe where cotton followed other crops, and especially where fields were isolated. Again no correlation was found with soil type, fertilizer used, or seed treatment.

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Grants $20,000 Fellowship

An industrial fellowship has been granted to the department of chemical engineering of the Virginia Polytechnic Institute by the R. H. Bogle Chemical Co., Alexandria, Va. The firm has underwritten to the extent of $20,000, a weed killer research program consisting of laboratory and field tests. The purpose of the investigation is to determine the comparative merit of numerous chemicals and chemical compounds proposed as weed killers, for killing a wide variety of weeds on actual field locations.

Industry Patents

2,476,057. MECHANISM FOR CUTTING, FOLDING AND SEALING THE BOTTOMS OF BAGS. Patent issued July 12, to Harry A. Mead, Los Angeles, Calif., assignor, by mesne assignments, to Kono Mead Equipment Corp., Flushing, N. Y. A mechanism for forming the bottoms of bags including a pair of coacting tooling rollers, means for feeding bag-making stock between said rollers as said rollers are rotated, means on said rollers for cutting the ends of bag from said bag-making stock, a pressure pad and a tucker guide on one of said rollers, a tucker on the other roller for tucking a portion of the bottom ends of the bags between said pressure pad and said tucker guide for forming a crease in the bottom portion of the bags, an ejector on one of said rollers for ejecting the creased portion of the bags from between said pressure pad and said tucker guide when said tucker is withdrawn from between said pad and said guide, means for applying adhesive to one side of the bottom portions of the bags, means for holding the bottom ends on said creases formed in the bags, and means for sealing said folded bottom ends to the bags with said adhesive applied thereto.

2,477,892. INSECTICIDAL LITTER AND BEDDING FOR POULTRY AND OTHER ANIMALS. Patent issued August 2, 1949, to Armas Paquette, North Grosvenordale, Conn. A combined litter, germicide and insecticide, comprising a heated mixture of finely divided pulverized quartz and feldspar with the admixture of tobacco ashes.

2,479,205. MANUFACTURE OF NITROGEN-CONTAINING COMPOUNDS. Patent issued Aug. 16, to Gerald D. Buckley and Neil H. Ray, Northwich, England, assignors to Imperial Chemical Industries, Ltd. A process for obtaining condensation products which comprises heating carbon monoxide and an amino compound in contact with a catalyst under a pressure above 1000 atmospheres at a temperature of from 150° C. to 300° C., said amino compound being selected from the group consisting of primary aromatic amines having at least two of the positions ortho and para to the amino group unsubstituted and N-formyl derivatives of said amines, said catalyst being selected from the group consisting of mineral acids and salts with said amines.

2,479,275. FUNGICIDAL COMPOSITION COMPRISING A PHENYL MERCURY SALT AND EXCESS LACTIC ACID. Patent issued Aug. 16, to Frank J. Sowa, Cranford, N. J. A composition for rendering materials resistant to the action of fungi comprising an aqueous solution containing a phenyl mercury compound and from ½ to 20 moles of lactic acid for each mole of the phenyl mercury compound in the solution.

2,480,010. ANTIFUNGUS WRAPPER AND METHOD OF PEST CONTROL. Patent issued August 23, 1949, to Lawrence H. Flett, Scarsdale, N. Y., assignor to Allied Chemical & Dye Corp., New York. A method of pest control which comprises subjecting organic material subject to infestation to the action of a dialkyl ester of alpha, beta-dichlorosuccinic acid in which the alkyl groups each contain not more than 4 carbon atoms.

2,481,279. CHEMICAL SPRAYING DEVICE. Patent issued September 6, 1949, to Louis L. Barr, Pittsburgh, Pa. A chemical spray device comprising a chamber of tubular form open at its ends, means for connecting the rear end of the chamber to a water hose, means for connecting the forward end of the chamber to a discharge nozzle, a radially disposed seating surface in the forward end of the chamber, a spider having seating engagement with said surface, a rod arranged to extend centrally through a block of soluble material in the chamber and having its forward end in threaded engagement with the said spider, and a spider at the rear end of the chamber and having a control opening for loosely receiving the rod, the connection between the rear end of the chamber and a hose comprising a valve block with which the chamber has screw-threaded engagement at its rear end.

2,481,438. N (ETHYL MERCURY)-P-TOLUENE SULFONANILIDE AS SEED DISINFECTANT. Patent issued September 6, 1949, to Dwight F. Mowery, Jr., Marblehead, Mass., assignor to E. I. duPont de Nemours & Co., Inc., Wilmington, Del. A dust composition useful as a seed disinfectant comprising as an essential active ingredient N(ethyl mercury) p toluene sulfonanilide in admixture with a finely divided inert powder.

TRADE MARK APPLICATIONS

CASCO, in cooper capital letters, for mechanical sprayer containing aerosol insecticide. Filed March 10, 1948, by Casco Products Corporation, Bridgeport, Conn. Claims use since Feb. 9, 1948.

DRAWING OF THIN PAPER MAN, for insecticidal chemicals. Filed Nov. 12, 1947, by Michigan Chemical Corp., Saint Louis, Mich. Claims use since Sept. 6, 1947.

AEROFUME, in thin capital letters, for insecticides. Filed July 26, 1948, by Eston Chemicals, Inc., Los Angeles, Calif. Claims use since June 9, 1948.

TWIN ROSE, in hand-drawn letters arranged on order of arcs, for fertilizer. Filed Oct. 27, 1947, by Twin Rose Products Co., Swink, Colo. Claims use since August 13, 1947.

DRAWING OF BIRD, with "Pajaro Verde" inscribed underneath, for germicidal and fungicidal preparations. Filed Mar. 15, 1948, by Medical Chemicals, Inc., doing business as Green Bird Ointment Co., Baltimore, Md. Claims use since Feb. 25, 1948.

PHOSCIDE, in stencil capital letters, for parasiticides—namely, insecticides, fungicides and weed killers. Filed Feb. 24, 1948, by California Spray-Chemical Corp., Richmond, Calif. Claims use since Jan. 9, 1948.

BLACKLEGOL, in caps and lower case, for antigen for prevention of blackleg in cattle. Filed Aug. 24, 1948, by Cutter Laboratories, Berkeley, Calif. Claims use since February, 1934.

CHARBONOL, in caps and lower case, for antigen for prevention of anthrax in livestock. Filed Aug. 24, 1948, by Cutter Laboratories, Berkeley, Calif. Claims use since March, 1935.

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AAEE Announces Program

A preliminary program for the Tampa meeting of the American Association of Economic Entomologists has been issued by Dr. John T. Creighton, Gainesville, Fla., secretary of the association. The meeting is scheduled for December 13–16.

The program calls for an address by Dr. A. M. Boyce, A.A.E.E. president, Riverside, Calif. on Tuesday.

Wednesday's meeting program includes a paper by Dr. P. N. Annand, chief of the Bureau of Entomology and Plant Quarantine, Washington, D. C., on programs to control the introduction and spread of insect pests in the U. S. Other speakers will include Dr. Metcalf, University of California Citrus Experiment Station; Dr. A. F. Camp, vice-director, Florida Citrus Experiment Station, and Dr. Orton, University of West Virginia.

Thursday's sessions will hear discussions on chemical residues in plant and animal products following the use of insecticides. Speakers in this section include representatives of the Food and Drug Administration; the Kerrville, Texas laboratory; the Bureau of Dairy Industry, U.S.D.A.; University of Utah; and the University of Wisconsin.

The annual dinner and dance will be held Thursday evening, and on Friday, the final day, a special session will be held on Insecticide Equipment. On this program will appear Earl D. Anderson, secretary, National Sprayer and Duster Association; H. G. Ingerson; Kenneth Messenger and Frank Irons of the U.S.D.A.; and J. L. Brann, Cornell University.

Another session on insecticide resistant insects will be held on Friday. Speakers here will include Dr. Boyce; G. C. Decker and W. N. Bruce, University of Illinois; S. W. Simmons, U. S. Public Health Service; W. V. King, B.E.P.Q., Orlando, Fla.; Floyd Smith, B.E.P.Q., Beltsville; and W. E. Blauvelt, Cornell University.

Classified Advertising

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Sales Manager: Established midwest manufacturer of insecticides, fungicides, weed killers. A real opportunity for an experienced sales manager with knowledge of midwest wholesalers, canners and dealers. State age, experience, compensation desired and present position. Address Box 383 care of Agricultural Chemicals.

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Aggressive Export Manager: Top performance record. Worldwide contacts. Desires agency for export or other form of close cooperation. Address Box 386 care of Agricultural Chemicals.

Cornell Graduate: Agronomy and Business School Degrees. Seeks permanent position with Agricultural concern in selling, purchasing, contract work, public relations or promotion. A-1 references. Address Box 388 care of Agricultural Chemicals.

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MISCELLANEOUS

Custom Spraying: Established business for sale with equipment. Business covers both industrial and agricultural insect control services. Owner wishes to concentrate on other business interests in different field. Opportunity for young energetic man to take over a good going business at very low price. Address Box 390 care of Agricultural Chemicals.

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Chemical Business Wanted: Physically handicapped sales executive (domestic and export experience) desires chemical business that can be run from home through mail order peddlers, etc. Address Box 387 care of Agricultural Chemicals.

Manufacturing Facilities: Large manufacturer in mid-west offers modern facilities for mixing, milling, packaging, etc. of chemicals, specialties, etc. Can handle large additional volume. Pack various size boxes, cartons, bags, drums. Opportunity for East or West Coast firm to manufacture low cost in mid-west. Can ship rail or own trucks. Full laboratory control. Experienced personnel. For further details, write Box 391 care of Agricultural Chemicals.

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Dr. Glasgow Retires

Dr. Robert D. Glasgow, New York State Entomologist, retired on August 31, following a long service. He had held his late position since 1928. During his 21 years as state entomologist, Dr. Glasgow has conducted research and has carried on projects in insect pest control of importance to agriculture.

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New Office for Velsicol

Velsicol Corp., Chicago, has announced the addition of a foreign division to its New York office. In charge of the foreign division is James A. Winter, formerly of Merchant Chemical Co. Address of the Velsicol New York office is 11 Park Place.

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2,4-D Patent Reissued

Rumors have been heard in trade circles of late to the effect that the Lontz 2,4-D patents had been reissued to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., and that a change in licensing procedure would be imminent.

James K. Hunt, du Pont technical advisor, says that these rumors are not entirely true, but that the Lontz patent on 2,4-D has been reissued as Patent No. Re. 23115. However, there is no change contemplated in licensing procedures. "As in the past," Mr. Hunt states, "the Boyce Thompson Institute is administering the licensing program on this patent, and is granting licenses to all applicants.

"The reissue patent, like the original, is owned by du Pont, but because of Boyce Thompson's experience in this field we have preferred to allow them to continue administering the licensing program," he explains.

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Dow Introduces "W-85"

A new soil fumigant formulation, "Dowfume W-85", was made available September 1 by The Dow Chemical Company. According to W. W. Allen of the Dow agricultural chemical sales division, "Dowfume W-85" was developed as a result of several years of field research and is a concentrated ethylene dibromide preparation.

Growth Regulant is Tested

Naugatuck Chemical Division of U. S. Rubber Co. has reported the development of a plant growth regulant, maleic hydrazide, which has a pronounced, but temporary, inhibiting effect on plant growth. The material is not available for any use other than testing by qualified technicians, the company says. The compound, 1,2-dihydropyridazine-3,6-dione, is slightly acidic in character and forms salts readily with alkalies.

Maleic hydrazine, its cupric salts and its zinc salt were dissolved or suspended in water at a concentration of 2,000 ppm. Six-inch tomato plants, in a greenhouse, failed to grow for two months after being sprayed with each suspension. Root growth was also inhibited, while the control plants grew in a normal fashion.

At a strength of 2000 ppm. a test tomato plant increased only 2.5 cm in 14 days, while the check plant grew 25 cm in that time. The percentage of inhibition was figured at 90%. At 560 ppm. the treated plant increased 7.0 cm, as compared to 25 cm in the check plant, for an inhibition of 72%.

Tests were also made on turf at the rates of 8, 4, 2 and 1 pound per acre. Results ranged from a slight retarding effect in the 1 pound application to a retarding of more than two months for the heaviest application. In the case of slight retardation, growth resumed normally after the quiescent period. Grasses thus inhibited included bluegrass, bentgrass, crabgrass, plaintain and chickweed.

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B. M. Gaddis, U.S.D.A., Dies

B. M. Gaddis, leader of the Division of Domestic Plant Quarantines of the U. S. Department of Agriculture Bureau of Entomology and Plant Quarantine, died August 25 at Arlington, Va. Mr. Gaddis had been in Federal agricultural work since 1929, and had held the position of Leader of the Div. of Domestic Plant Quarantines since 1934.

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Spraying Systems Co. 70
Sprout, Waldron & Co. Sept.
Stauffer Chemical Co. 62
Tennessee Corp. Sept.
Texas Gulf Sulphur Co. 50
Thompson-Hayward Co. 14
Tobacco By-Products & Chemical Corp. 64
Todd Shipyards Corp. 72
Townsend, Dr. G. R. 80
Union Bag Co. 20
United Clay Mines Sept.
U. S. Industrial Chemicals 48
Vanderbilt, R. T. & Co. 67
Velsicol Corp. Sept.
Virginia-Carolina Chemical Corp. 64
Wisconsin Alumni Research Foundation 76
Wolf, Dr. Benjamin Sept.
Young Machinery Corp. 76

. . . About The Residue Tolerance Hearings

THE forthcoming hearings to establish residue tolerances on commercially produced fresh fruits and vegetables scheduled by the Food and Drug Administration, provide another opportunity for members to call on the

Technical

Legislative

Legal

Information

services of the National Agricultural Chemicals Association.

As an example, NAC will issue special bulletin services covering the important aspects and developments of the hearings.

This is but another of the many valuable activities of NAC in the interests of members and the Industry.

★ ★ ★

National Agricultural Chemicals Association

. . . Formerly the AIF Association

Barr Bldg., 910 17th St., N.W. Washington 6, D. C.

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